JANUARY 31, 1931

Railway Age

Founded In 1856

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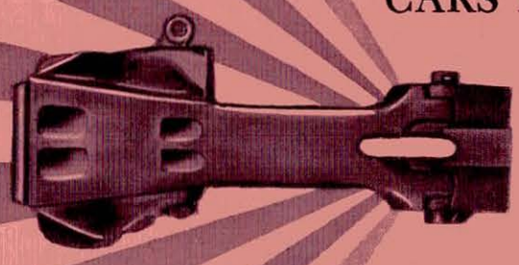
No.
BEAVER PA

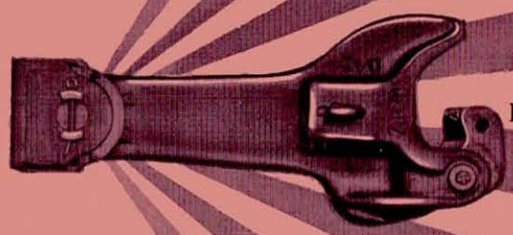
EXCESS FREE SLACK
IN LONG TRAINS IS A
MENACE

THE "RUN-IN" OF REAR CARS WITHOUT
LOSS OF SPEED, DUE TO LAG IN
AIR PRESSURE REDUCTION

DAMAGES

CARS AND LADING





TWO-THIRDS OF THE FREE SLACK

DUE TO RIGID SHANK COUPLER WEAR

CAN BE ELIMINATED

BY USE OF THE

SYMINGTON
SWIVEL BUTT COUPLER

OVER 100,000 IN USE ON 45 CLASS I RAILROADS

They Always Pass the "Close Up" Test

THEY look good on the surface and are good beneath. The whole structure is sound and decay-free. Why? Because ***International*** Ties are first manufactured and graded exactly to A.R.E.A. Specifications and then seasoned properly.

Put a rule on any ***International*** Ties in any stack. You will be surprised to find how big they are.

Investigate further. See where ***International*** Ties are seasoned. Never on the right-of-way, but on specially built seasoning yards that are tile drained and free from vegetation.

Note the uniform method of stacking, the wide air spaces and the minimized surface contacts between the ties. These are worthwhile precautions which prevent decay.

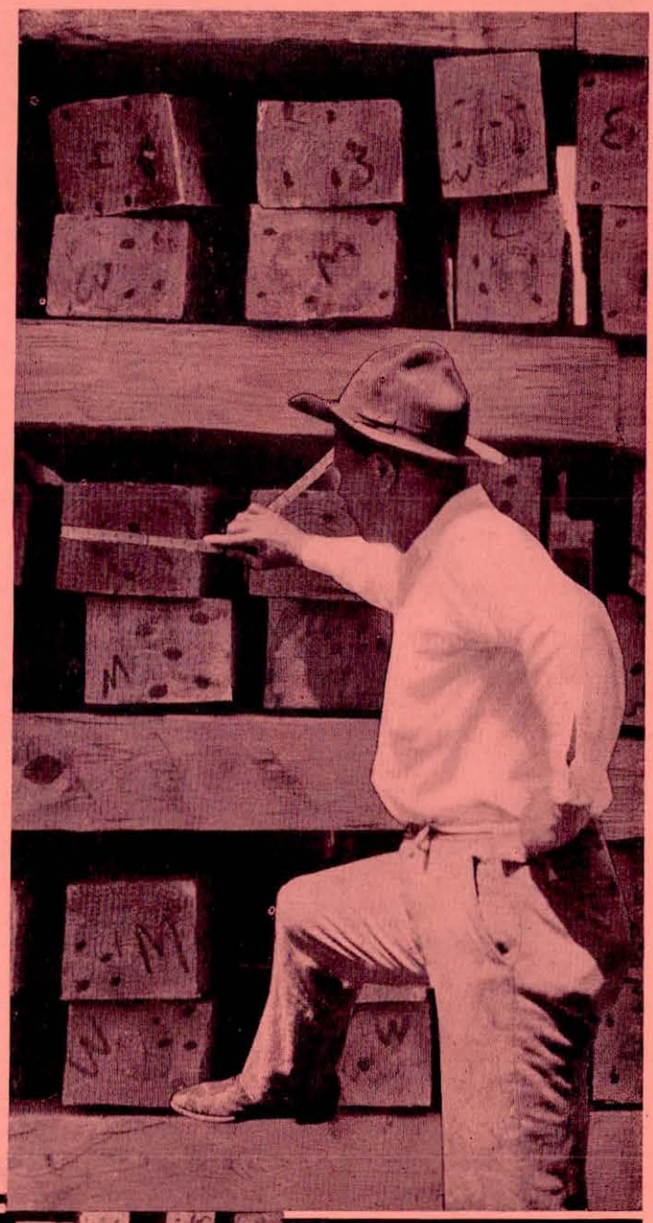
In the treatment, check the creosote oil, the absorption, the depth of penetration—you will find quality in its broadest sense.

International Ties will prove a big economy. Their long life in track reduces annual tie renewals. The larger full bodied ties assure a stronger and safer track structure.

Contract now for future delivery.

International Creosoting & Construction Co.
General Offices: Galveston, Texas
Plants: Texarkana - Beaumont - Galveston

International
Quality Treated Ties



3¢1
The International Dating Nail

This dating nail is your assurance that the tie is a Standard A.R.E.A. Specification Tie.

Full Size
Sound Timber
Properly Seasoned
Scientifically Treated

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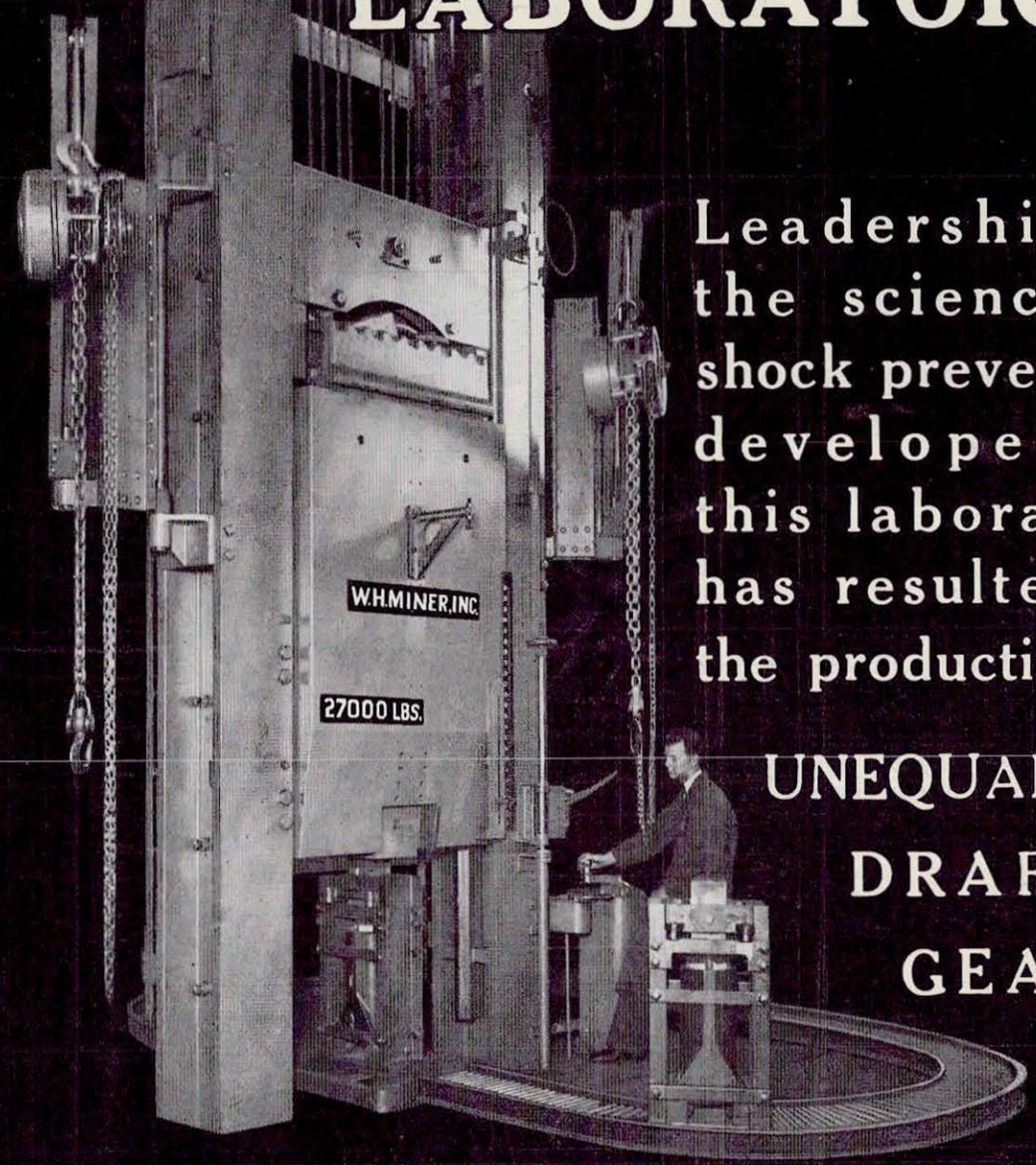
MINER

RESEARCH LABORATORY



Leadership in the science of shock prevention developed in this laboratory has resulted in the production of

UNEQUALLED DRAFT GEARS

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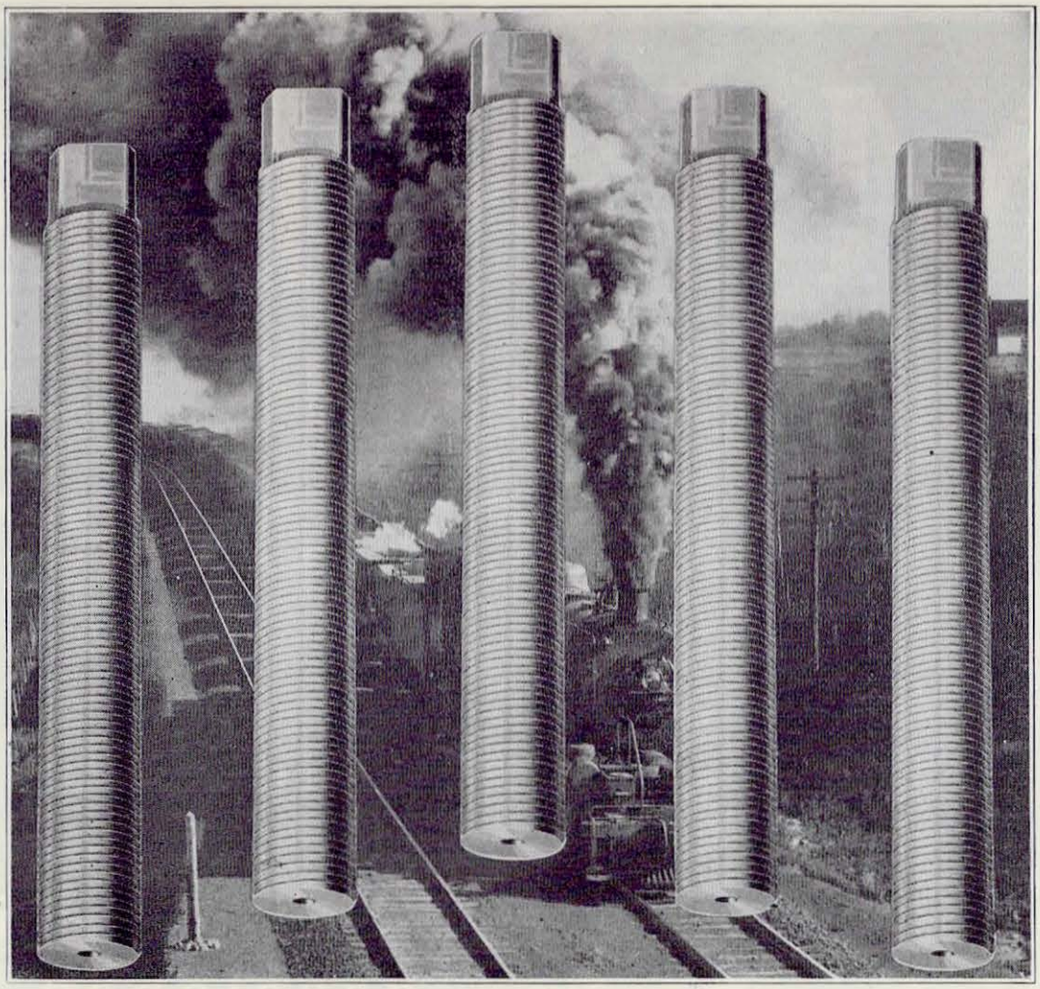

They Last Longer —Yet Cost No More

It's the special iron—tough, strong and ductile—that gives the extra life to Lewis Special Hollow Staybolts.

Every bolt is made from a solid bar of Lewis Special Iron, as fine an iron as can be produced for staybolt purposes. Its long rope-like fibre offers unusual resistance to vibration, and the continual warping and buckling of the firebox sheet.

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Lewis Special Hollow Staybolts

Conform to A.S.T.M. Spec. A-84-27 (Grade A)

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Railway Age

With which are incorporated the Railway Review, the Railroad Gazette and the Railway Age-Gazette. Name Registered U. S. Patent Office.

Vol. 90 January 31, 1931 No. 5

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Tells how this road surmounted unusual construction difficulties in elevating its tracks for 1⅓ miles through suburb of Philadelphia, Pa.

Users of Highways for Private Gain Should Pay Adequate Rental 283

F. J. Lisman suggests a specific plan for assessing heavy vehicles on mileage basis for added road construction and maintenance costs they make necessary.

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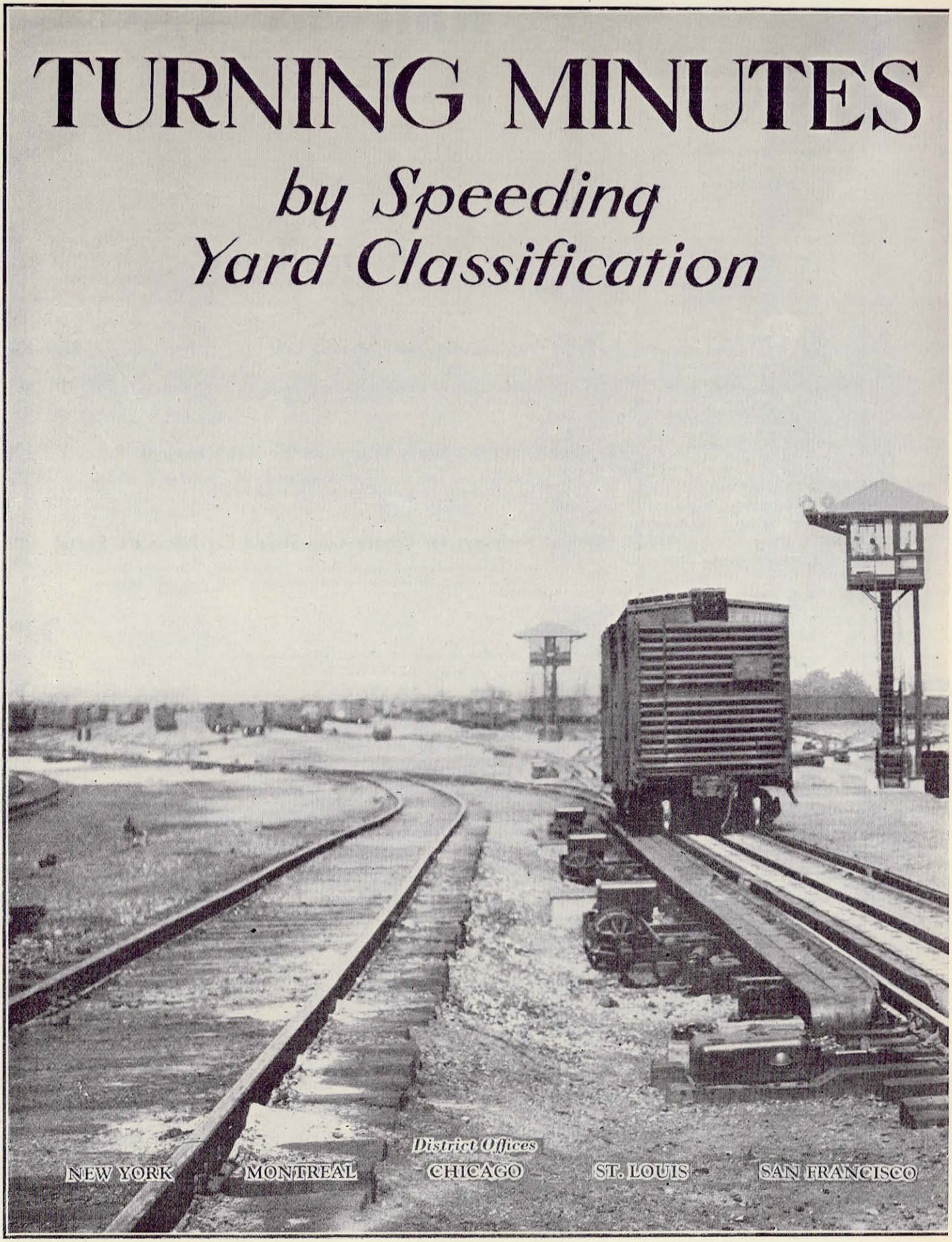
TURNING MINUTES

by Speeding Yard Classification



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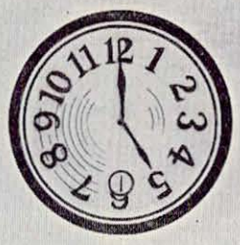
NEW YORK MONTREAL CHICAGO ST. LOUIS SAN FRANCISCO

INTO DOLLARS



SPEEDING up classification of cars through the yard, is saving those valuable minutes which greatly reduce switching service costs, hostler expenses, per diem charges, and savings in many other operating accounts.

"Union" Electro-Pneumatic Car Retarders make possible a smooth and continuous movement of cars through a terminal or yard; speed shipments; minimize accidents and damages to equipment; materially reduce labor costs; facilitate yard operation.

The efficiency of these retarders saves the valuable minutes which are converted into earned dollars. Savings ranging from 25 to 50 per cent on the investment for new equipment are being made. They pay for themselves in from two to four years.

Ask our nearest district office to explain to you how you can turn minutes into dollars by speeding classification in your yards and terminals. You incur no obligation.

1881 TRADE MARK Union Switch & Signal Co. TRADE MARK 1931

SWISSVALE, PA.

To Handle Fast Freight Over Difficult Profiles

2-10-4 TYPE LOCOMOTIVE
SANTA FE SYSTEM

Cylinders	30″ x 34″
Drivers, diameter	69″
Steam pressure	300 lb.
Grate area	121.5 sq. ft.
Water heating surface	6114 sq. ft.
Superheating surface	2741 sq. ft.
Weight on drivers	349,910 lb.
Weight, total engine	502,260 lb.
Tractive force	93,000 lb.

INCREASED speed in freight traffic is one of the most insistent demands now being made upon the railroads. The "drag freight" has been replaced by trains operating on fast, regular schedules. To economically and efficiently handle such trains requires locomotives which combine hauling and speed capacity to an exceptional degree.

The locomotive illustrated, recently built for the Santa Fe System, develops a starting tractive force of 93,000 pounds, and has 69-inch drivers and a grate area of 121.5 square feet. These figures indicate the extent to which hauling and speed capacity are combined in this design—one that is particularly fitted for handling heavy traffic over difficult profiles.

The modern freight hauler must be specially designed for the service. We are prepared, as never before, to meet motive power requirements of any railroad.

THE BALDWIN LOCOMOTIVE WORKS

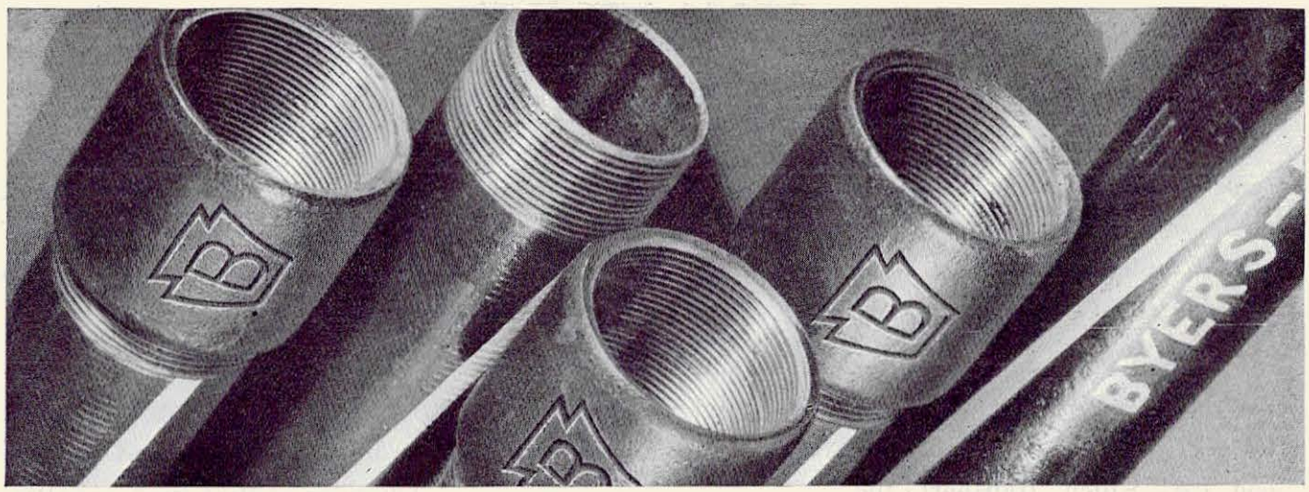
PHILADELPHIA

PERMANENCE!

★ ★ ★

Permanence of pipe in railroad buildings and terminals is as important to the engineering department as continuous pipe service is to the mechanical department. Permanence is the direct result of "pipe prescription." And

BYERS • GENUINE • WROUGHT-IRON PIPE



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"pipe prescription" is designating the right pipe for the right place. Railroad experience has proved there are *right* places for Byers Genuine Wrought-Iron Pipe. A nation-wide experience enables us to offer our services in the solution of any railroad pipe problem. A. M. Byers Company, Pittsburgh, Pa. Established 1864.

AN INVESTMENT — NOT AN OUTLAY

SATURDAY NIGHT

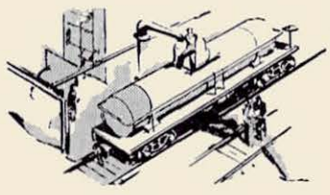
It's no longer Punishment *to take a bath*

Soap. In grandmother's day it was strong, harsh and cruel. Tender skins smarted and burned under it and there was no ordeal like Saturday night's bath.

Now many fine soaps can be had at small cost. They have been made possible largely by the genius of the men who invented the railroad cars which transport the oils, alkalies and fats of which most soaps are made. These men ushered in a new era of soap manufacture and the coarse product of the home and crude factory disappeared.

Every one of the hundreds of cars built by General American was designed to solve transportation problems created by man's advancement and changing times. Without them we would not have many of the things that make life so comfortable.

The building of all kinds of railroad cars—tank, refrigerator, milk, express, stock, gondola and others—is but one phase of General American's diversified activities. It maintains, in addition, a vast fleet of 40,000 cars which it leases to shippers throughout the country . . . also a large export terminal for the storage, loading and packaging of all bulk liquids, besides operating an extensive European freight transportation system.



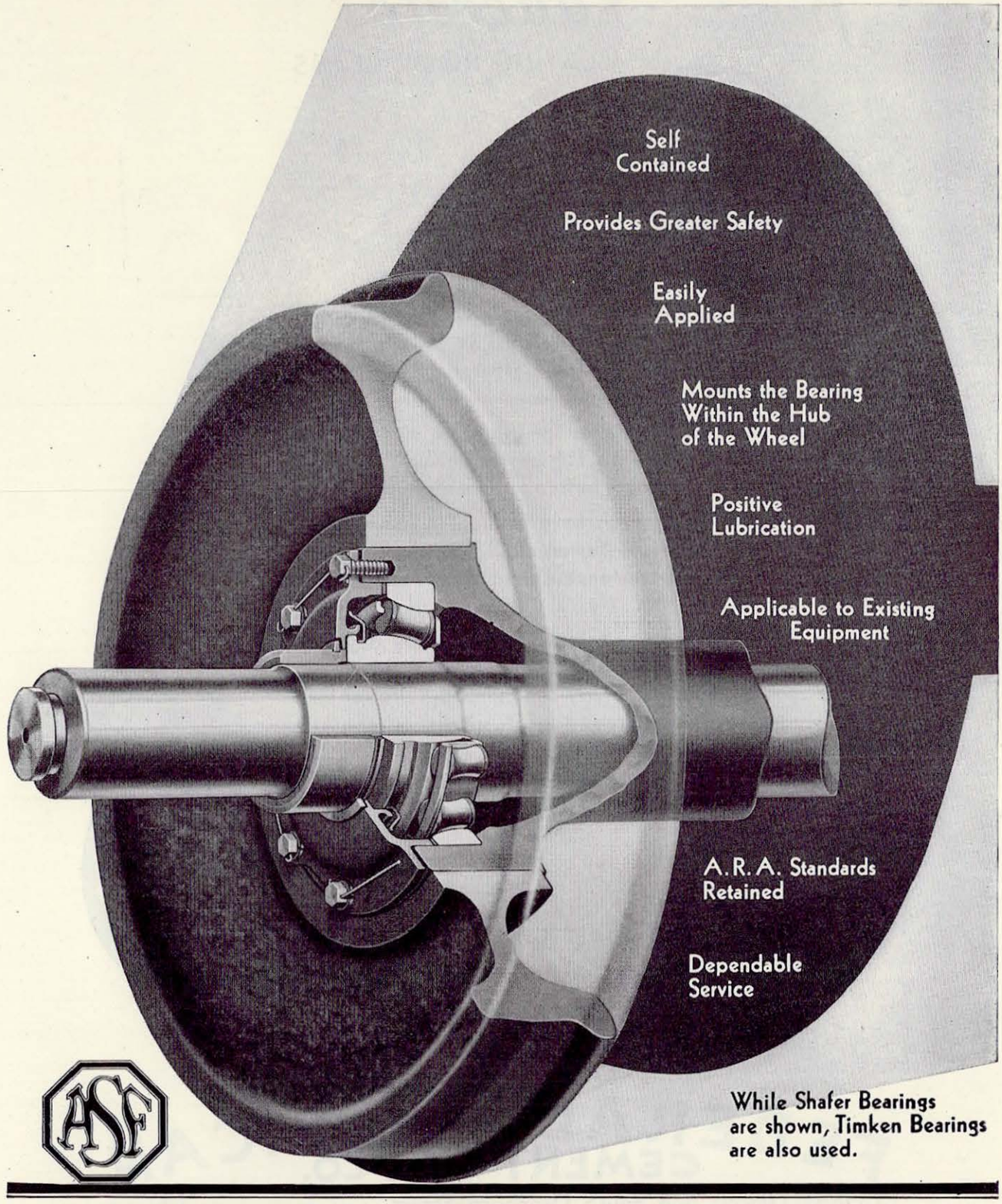
No matter what you are shipping, you will find it profitable to confer with our engineers. Railroad transportation is always dependable—a railroad car can be built to carry any commodity in bulk. Address Continental Illinois Bank Building, Chicago, Illinois.

GENERAL AMERICAN TANK CAR CORPORATION

"a railroad freight car for every need"

"THIS ADVERTISEMENT APPEARS IN FEBRUARY ISSUES OF NATIONAL MAGAZINES TELLING EXECUTIVES SOMETHING ABOUT OURSELVES AND STRESSING THE FACT THAT RAILROAD TRANSPORTATION IS ALWAYS DEPENDABLE."

American Steel Foundries Roller Bearing Unit


Self Contained
Provides Greater Safety
Easily Applied
Mounts the Bearing Within the Hub of the Wheel
Positive Lubrication
Applicable to Existing Equipment
A.R.A. Standards Retained
Dependable Service
While Shafer Bearings are shown, Timken Bearings are also used.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

Featherweight Concrete

INSULATING ROOF SLABS

HAYDITE aggregate, used instead of sand, through its millions of trapped air cells, makes a concrete, different and better than any other structural roof material known.

Better because lighter for the same strength (as low as 10 lbs. per sq. ft.); better because of an insulating value never before obtainable in concrete.

Featherweight slabs have brought a new era to roof construction—fewer and lighter steel purlins, undoubted permanence, fire-safety, freedom from all maintenance. No painting required.

These are facts, substantiated by every day experience on innumerable prominent buildings — public, industrial, utility and railroad—all over the country. "Catalog and Roof Standards" on request.

Featherweight Concrete slabs are also available with nailing surface for fastening ornamental covering.

10 POUNDS *Per Square Foot*

Made, Laid and Guaranteed by

FEDERAL-AMERICAN CEMENT TILE CO.

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FOR OVER A QUARTER CENTURY

ARMCO'S

Newest, proved Contribution to More-enduring Safe drainage

Armco Paved Invert (triple paved) Pipe installed by the Armço threading method under a railroad in Georgia.

Being widely adopted by railroads

THEIR OWN TESTS have proved to railroads that Armco Paved Invert Pipe possesses greater durability. And therefore increased safety—at lower cost per year. Five years of use of this remarkable Armco creation show that the paved invert principle is more than an important step ahead . . . That it actually solves to a marked extent the ages-old problem of culvert destruction by erosion.

Armco Paved Invert Pipe is paved where the wear comes—in the invert. Its basic structure of Armco Corrugated Iron Pipe (with an unequalled record of 25 years service to date) is paved with a tough bituminous material which effectively resists the wear of silt, sand, stones, and even boulders.

Evidences of its success are widespread, for railroads in increasing number are adopting Armco Paved Invert Pipe as standard construction. A check up of per-year costs of various types and kinds of culverts will reveal the added safety and economy factors present in this exclusive Armco product.

Armco engineers are at your service. Address the Association for factual data.

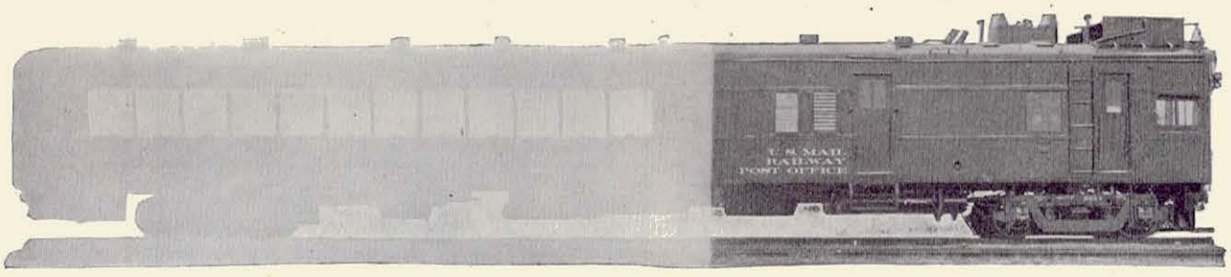
Armco culverts and drains are manufactured from the Armco Ingot Iron of the American Rolling Mill Company and always bear its brand.

ARMCO CULVERT MANUFACTURERS ASSOCIATION *Middletown, Ohio*

C, 1931, ACMA

ARMCO
Paved Invert
PIPE

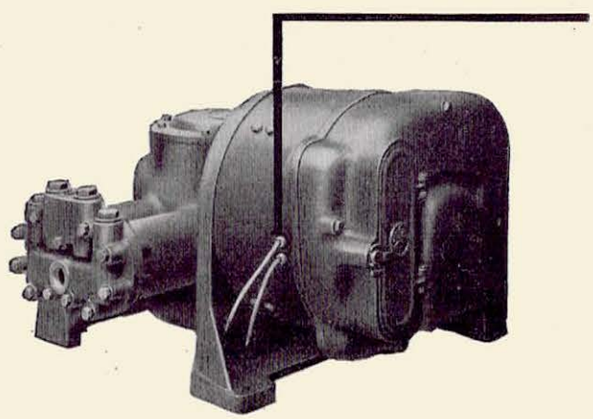
The G-E end



THIS General Electric equipment is designed especially for motor cars. It transmits the engine power to the driving wheels smoothly and efficiently, yet it is simple and reliable, and accessible for inspection and maintenance. Twenty-five years of experience in building this type of equipment has developed a transmission which withstands the severe service encountered in railroad operation, with minimum maintenance costs. Records show that the gas-electric car has effected large savings for steam-road operators and that the availability of this class of motive power usually exceeds 90 per cent.

Since 1924, General Electric has manufactured equipment for more than 400 gas-electric rail cars, ranging in size from 100 to 800 horsepower. This equipment includes generators, traction motors, radiator-fan motors, air compressors, control devices, and accessories such as meters, instruments, wire and cable — all built to meet the exacting requirements of railroad service.

When you specify G-E drive with G-E accessories, you obtain equipment which has been thoroughly proved in service. Ask your nearest G-E office for complete information.



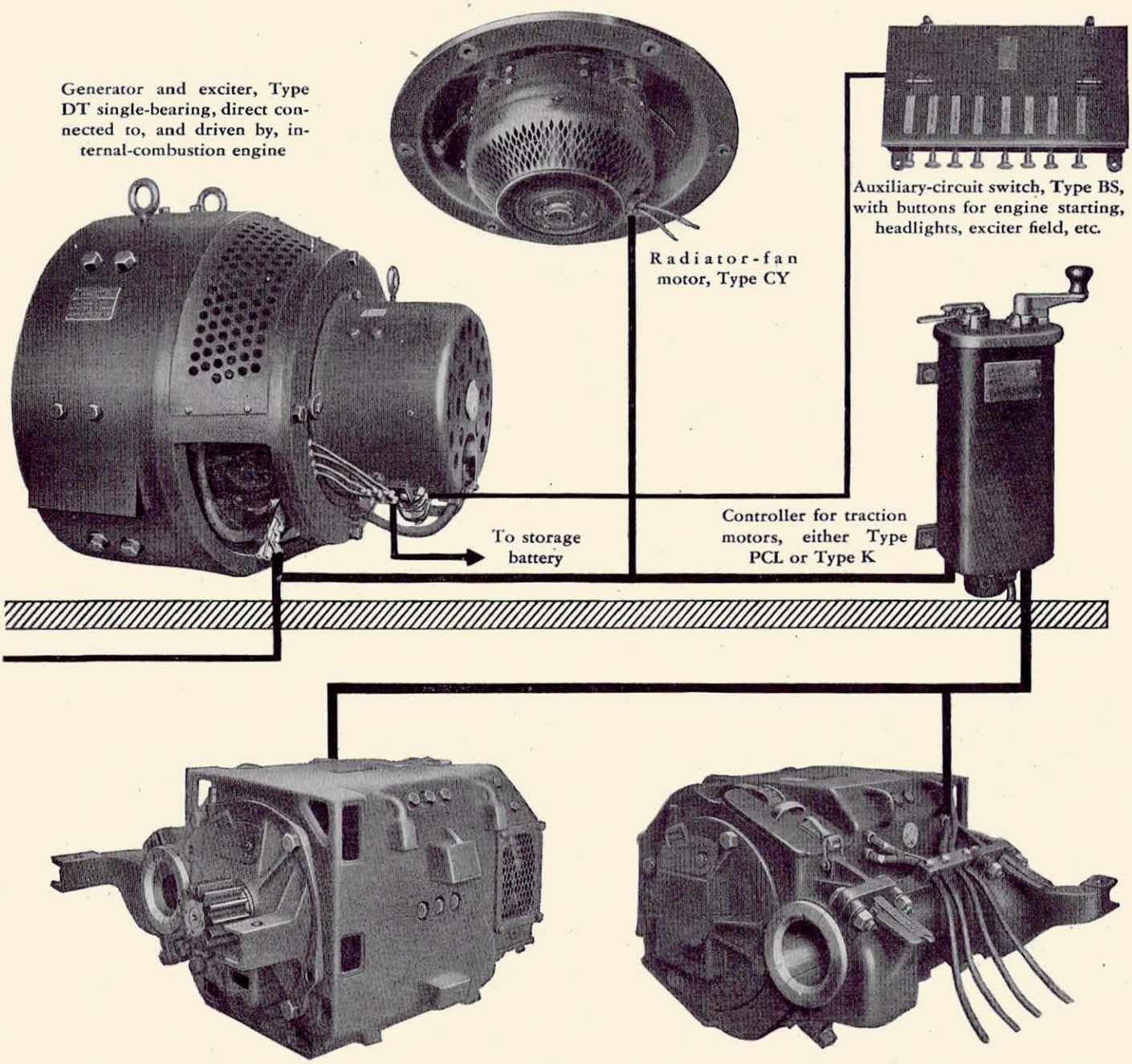
Motor-driven air compressor, Type CP, for air brakes

WHEN BUYING
GAS-ELECTRIC CARS
SPECIFY G-E DRIVE

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

# of your motor car

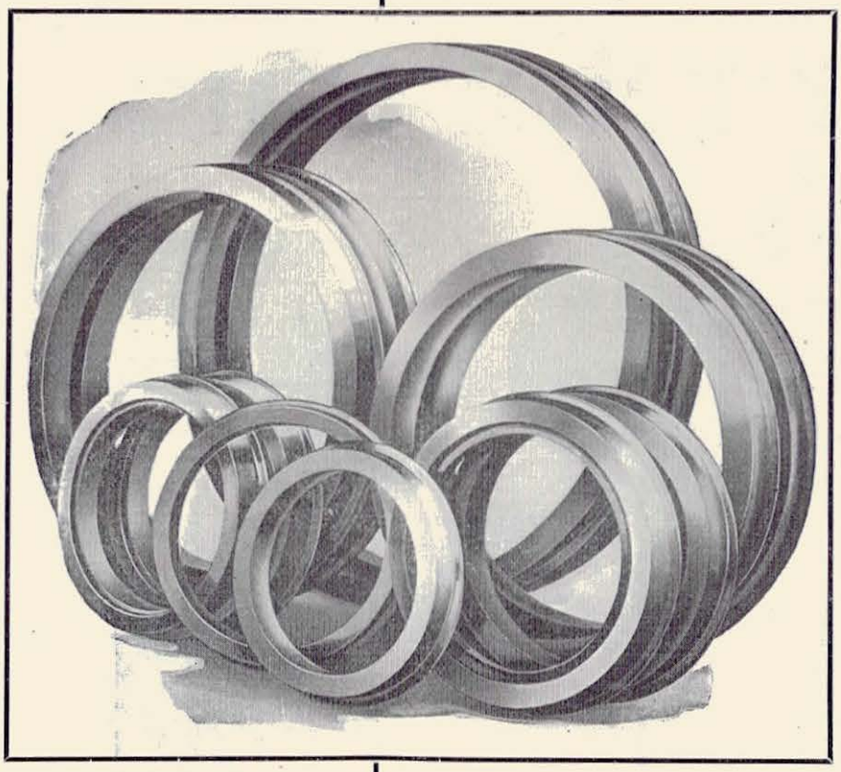

Generator and exciter, Type DT single-bearing, direct connected to, and driven by, internal-combustion engine
Radiator-fan motor, Type CY
Auxiliary-circuit switch, Type BS, with buttons for engine starting, headlights, exciter field, etc.
To storage battery
Controller for traction motors, either Type PCL or Type K

Traction motors, Type GE, installed in driving truck, complete with gearing, gear cover, and axle linings

391-40

ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES



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Wheels

Springs

For Every Type of Rolling Stock In Every Class of Service

"RAILWAY" locomotive and car wheel tires are made to meet the particular requirement of service. It may be the long continued run of the passenger train or the many stops and starts of the switcher with its constant crowding through switches. For every type of use a tire must be employed that will give the maximum life if there is to be the greatest economy.

Only experience and laboratory research can provide that knowledge. You find it in all "Railway" products.

Railway Steel-Spring Company

30 CHURCH ST., NEW YORK

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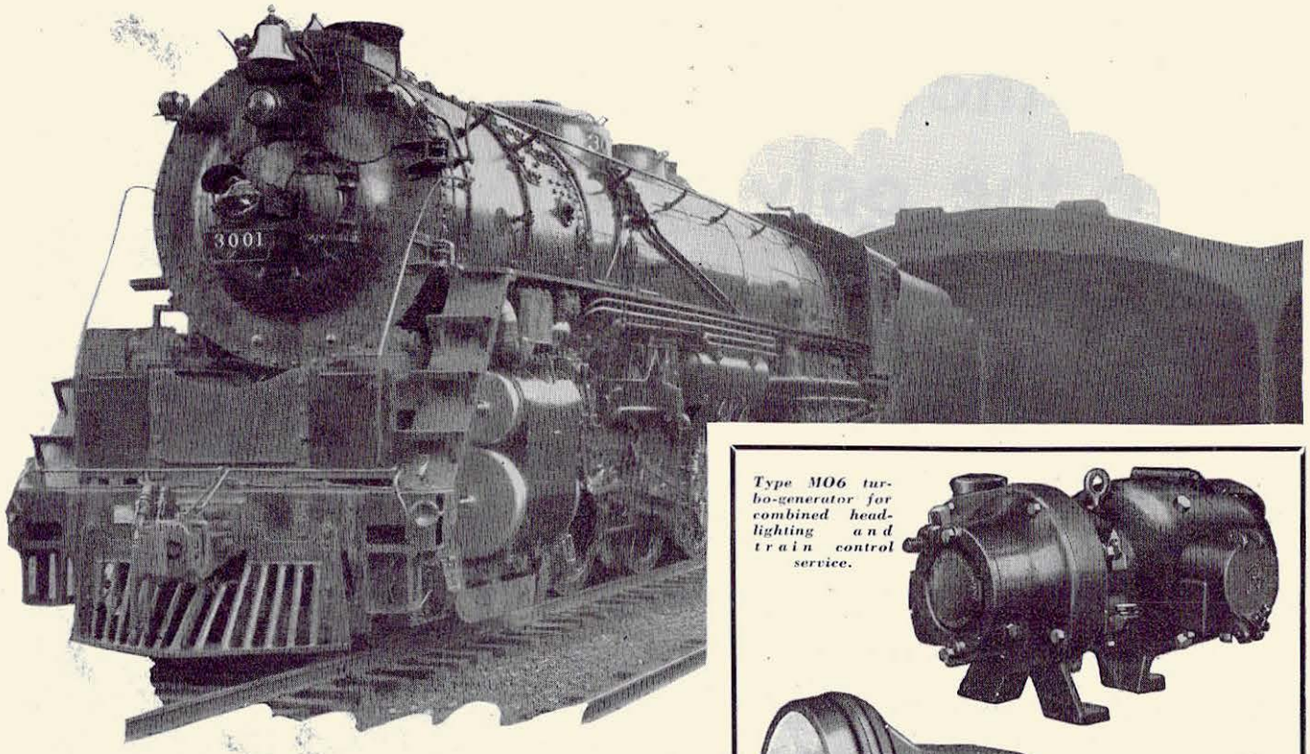

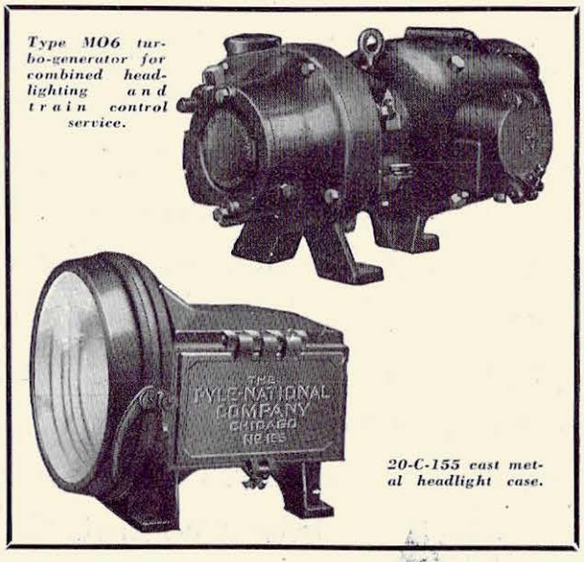

Type MO6 turbo-generator for combined headlighting and train control service.

20-C-155 cast metal headlight case.

Pyle-National lights the way for modern giants of railroading

PYLE-NATIONAL headlights, tried and tested by years of railroad service, have earned their place on the modern giant motive power. Types for every requirement are made with uniform durability and deliver the same efficient performance through years of service.

Pyle-National products—Headlights, Turbo-generators, Train lighting equipment, and wiring appliances, are of the quality that justifies the phrase, "Pyle-Natlonal Equipped" appearing so frequently in specifications of the finest locomotives. Write for bulletins describing the features of the complete Pyle-National line.

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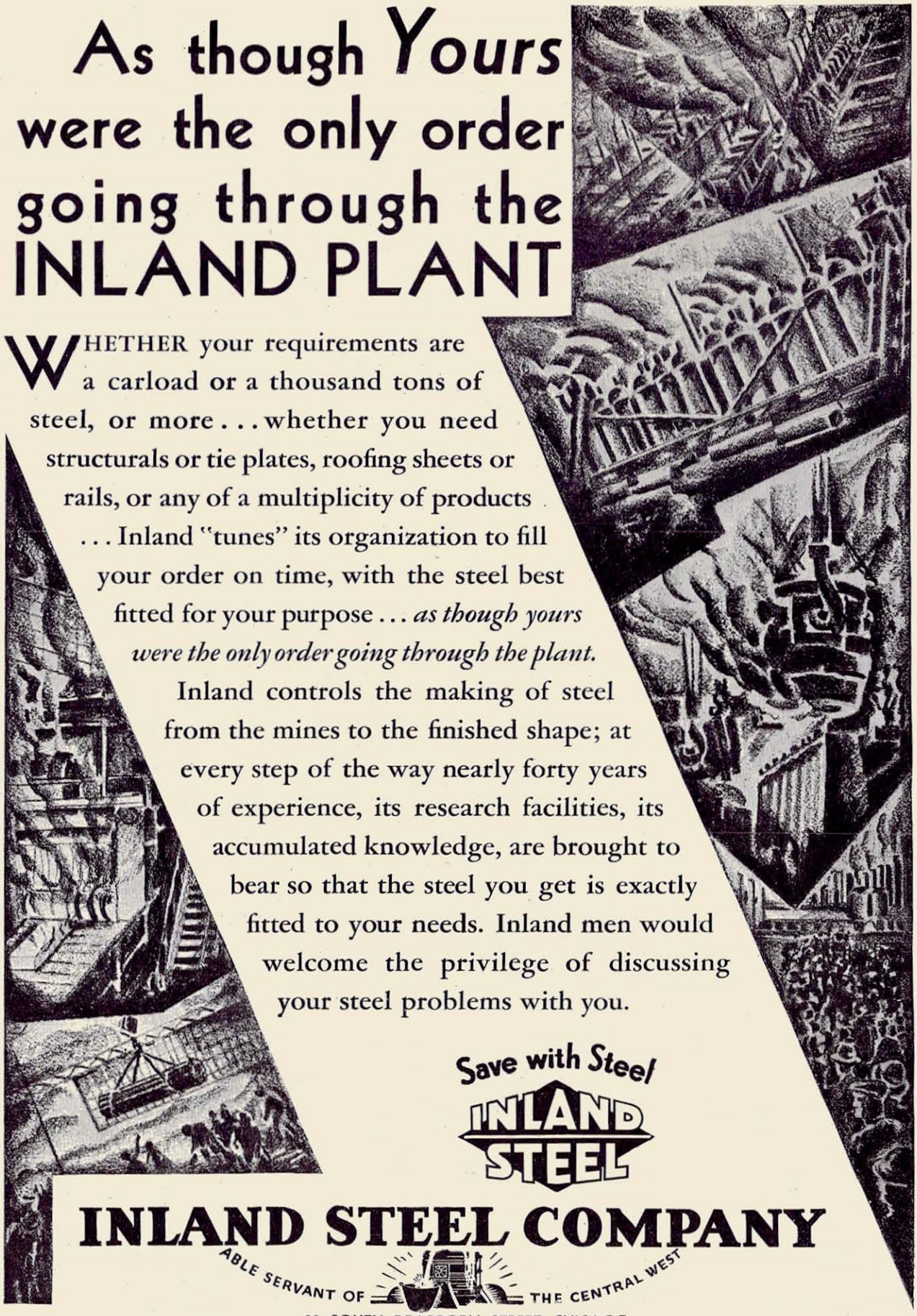
RA1-31Gray

As though *Yours* were the only order going through the INLAND PLANT



WHETHER your requirements are a carload or a thousand tons of steel, or more . . . whether you need structurals or tie plates, roofing sheets or rails, or any of a multiplicity of products . . . Inland "tunes" its organization to fill your order on time, with the steel best fitted for your purpose . . . *as though yours were the only order going through the plant.*

Inland controls the making of steel from the mines to the finished shape; at every step of the way nearly forty years of experience, its research facilities, its accumulated knowledge, are brought to bear so that the steel you get is exactly fitted to your needs. Inland men would welcome the privilege of discussing your steel problems with you.

Save with Steel

INLAND STEEL

INLAND STEEL COMPANY

ABLE SERVANT OF THE CENTRAL WEST

38 SOUTH DEARBORN STREET, CHICAGO

Sheets Bars Bands Plates Structurals Rails Track Accessories Rivets Billets

TWO MILES FOR THE PRICE OF ONE

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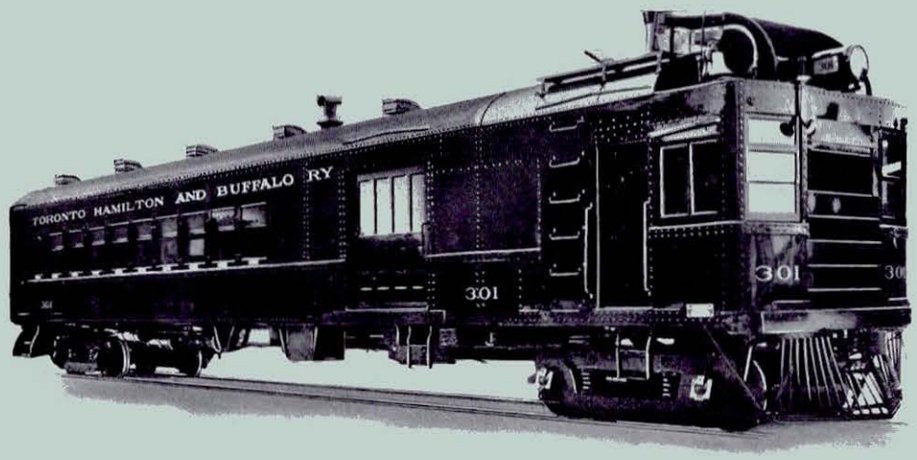
No.
BEAVER FALLS, PA.

ON THE T H AND B



FROM December 14, 1927 to May 31, 1930—a period of 29½ months—an Electro-Motive Car on the Toronto, Hamilton and Buffalo Railway covered 93.8% of its scheduled mileage * or . 159,958 miles

To cover this mileage with steam trains (replaced by the Electro-Motive Car) would have cost, including fixed charges, 94.26¢ per mile, or . $150,776.41

The actual cost of motor car operation,** including fixed charges, was 46.32¢ per mile, or . . . 74,092.55

By cutting its per mile cost to less than half—literally running two miles for the cost of one—the T. H. and B., in the short space of 29½ months, has saved $76,683.86

Electro-Motive Cars return their cost in very short time.

*Scheduled mileage, 170,388 miles. Steam train miles while rail car was in shop for general overhauling of car body and trucks, including repainting, 8,791 miles. Total steam train miles, other causes, 1,639. Power plant has not yet required any extensive overhauling.

** Fuel cost 19.3¢ per Imperial Gallon

FROM 94.26¢ PER MILE TO 46.32¢ PER MILE ON THE TORONTO HAMILTON AND BUFFALO

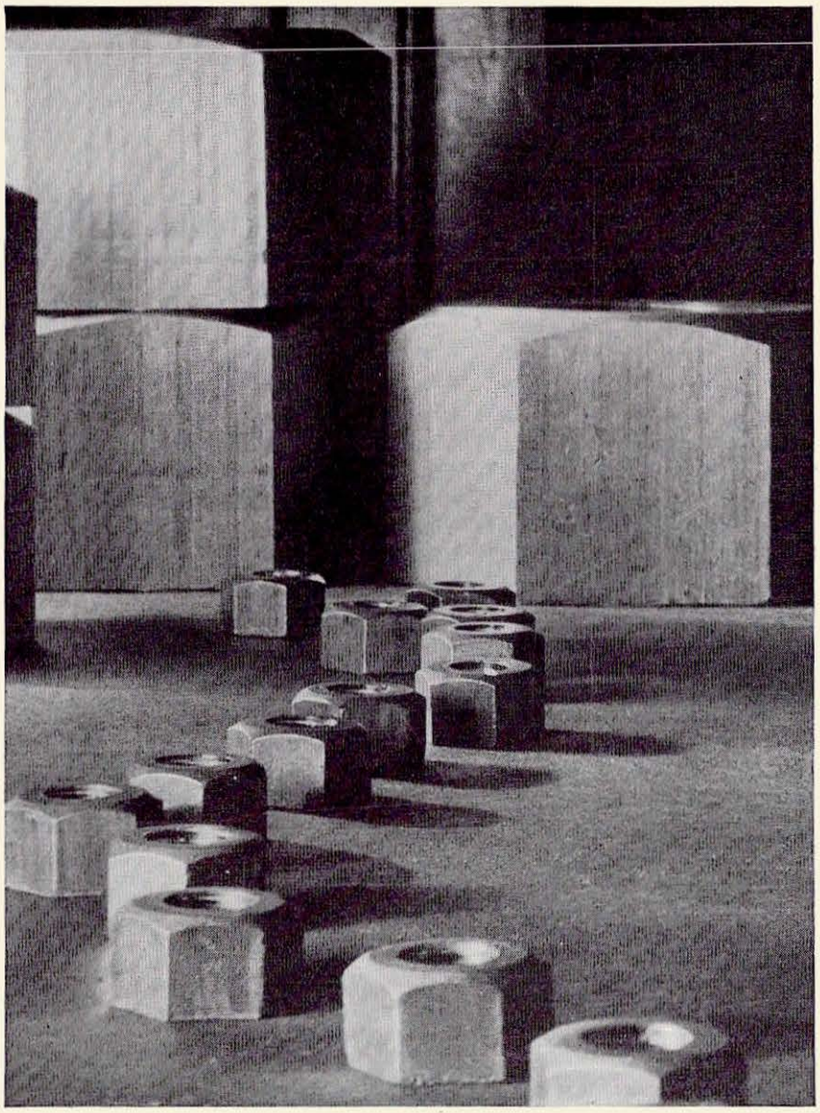
Only company engaged exclusively in the design, manufacture and sale of gas-electric power plants for railway service

THE ELECTRO-MOTIVE COMPANY

CLEVELAND . . . . . OHIO

NEW YORK Graybar Bldg. | CHICAGO Peoples Gas Bldg. | ST. LOUIS Railway Exchange Bldg. | SAN FRANCISCO Rialto Bldg.

GAS-ELECTRIC | MOTOR CARS LOCOMOTIVES POWER PLANTS | GAS-ELECTRIC



BOURKE-WHITE PHOTO

Use *the* EMPIRE Bolt Planning Service

MACHINE designers, purchasing agents and shop men are invited to use the R B & W staff's engineering facilities for guidance in specifying the various types and sizes of bolts and nuts they use. In the many years we have been making EMPIRE nuts and bolts for America's premier industries, we have assembled a wealth of technical data on the relative strength and strain resistance of the various bolts now in popular use.

Important savings of time and money have been effected by many large corporations following analysis of their requirements by our engineers. In many cases, we have shown where special bolts could be replaced with standard bolts, and the number of sizes used considerably reduced. This technical service is available without charge or obligation. We should be glad to review your present bolt and nut specifications and to make suggestions based on scientific knowledge and a wide range of practical experience. Your request, addressed to our nearest office, will bring you the full particulars.

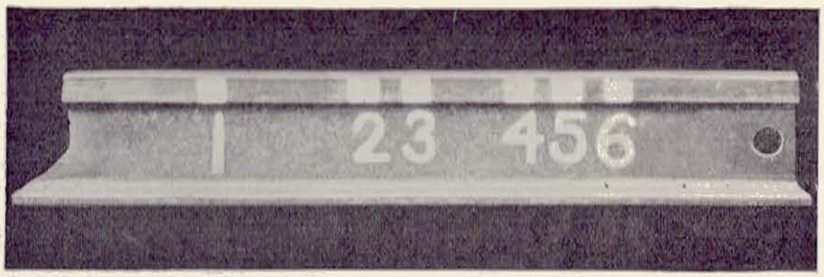
RUSSELL, BURDSALL & WARD BOLT & NUT CO.

PORT CHESTER, N. Y. ROCK FALLS, ILL. CORAOPOLIS, PA.

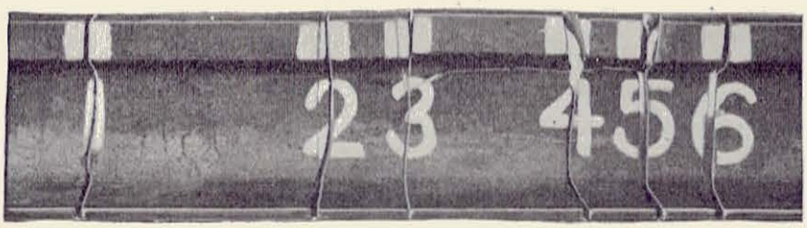
Sales Offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.

BOLTS EMPIRE NUTS-RIVETS

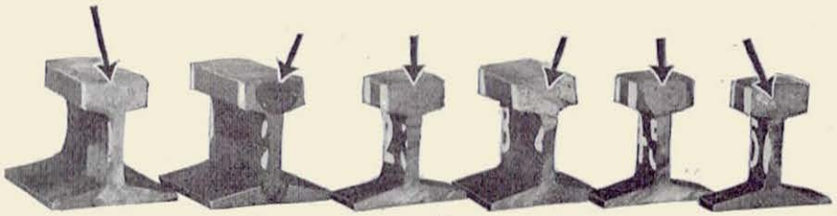
MULTI-FISSURE RAILS . . . . 16% of the defective rails found are of this dangerous type



SIX FISSURES WERE INDICATED IN TRACK AS ABOVE



THE RAIL WAS BROKEN



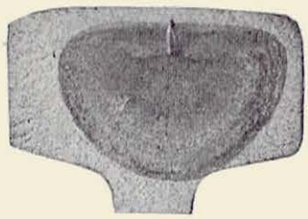
THESE SIX FISSURES WERE FOUND

IN an apparently perfect stretch of track, a Sperry Detector Car discovered this multi-fissure rail. Only one of the six defects had come to the surface. Even this was so hidden that the practiced eye of the track walker missed it.

■ In thousands of miles of track tested by Sperry Rail Service, 16% of the defective rails located were of this dangerous type with two or more transverse fissures per rail. December results showed this figure to be 25%.

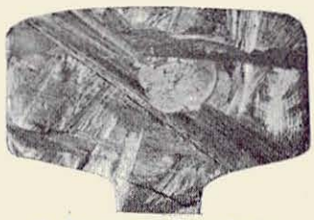
■ By causing the replacement of such rails, Sperry Rail Service prevents derailments and costly repairs to track and property. In this way Sperry Rail Service soon pays for itself.

1 Typical transverse Fissure Area 15%.

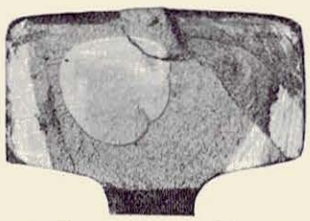


2 This fissure has just reached the surface, causing discoloration. Area 62%.

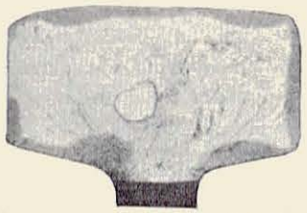
3 A typical clearly-defined fissure. Area 28%.



4 A transverse fissure having an area of 6.8%.



5 The opposite face of fissure marked No. 5. Area 20%.



6 An interesting nucleus of only 2.7% area. But the Sperry Car detected it.

SPERRY RAIL SERVICE

SPERRY PRODUCTS, INC.

Sperry Building, Manhattan Bridge Plaza, Brooklyn, N. Y.

Chicago Office: 80 East Jackson Blvd.

CHILLED TREAD WHEELS

1884—Five Million Chilled Tread Wheels in Service
1914—Twenty Million Chilled Tread Wheels in Service
1930—Twenty-Four Million Chilled Tread Wheels in Service

The wonderful development of transportation facilities has been made possible by the Chilled Tread Car Wheel.

Since the Chilled Tread Wheel was put in service in 1850, wheel loads have increased 800 per cent. One wheel now carries as heavy a load as was then carried by eight. But today the Chilled Tread Wheel, as a result of scientific work in the laboratory and in the foundry, provides a greater factor of safety than ever.

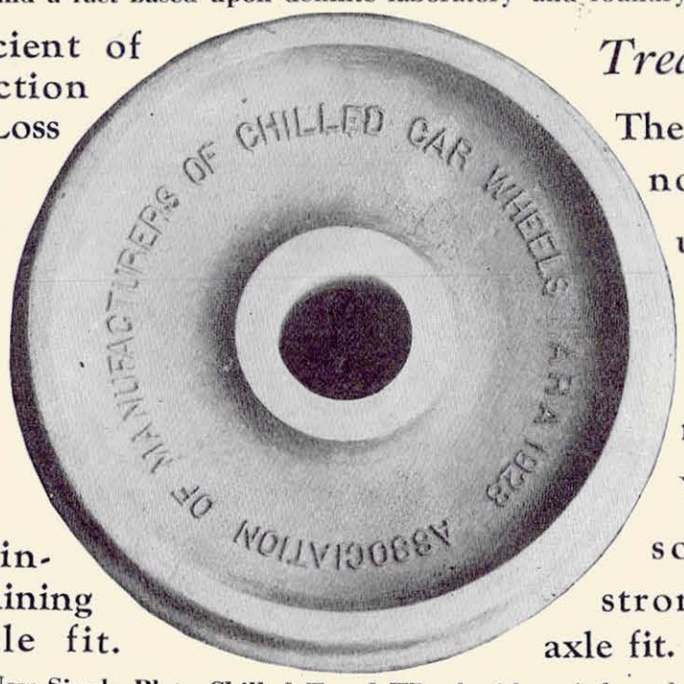
Better Every Year

A slogan and a fact based upon definite laboratory and foundry programs.

Highest Co-efficient of Brake Shoe Friction with Minimum Loss of Brake Shoe Metal.

The hard tread becomes polished in service, reducing to a minimum wear between wheel and rail.

The soft hub insures easy machining and perfect axle fit.



Tread Hardness

The chilled tread will not crush or flow under the heaviest loads. It is the hardest usable metal known.

Yet, the hubs are soft, insuring a strong and perfect axle fit.

The New Single Plate Chilled Tread Wheel with re-inforced flange.
Over four million now in service with an unexcelled service record.

SAFETY
ECONOMY
SERVICE

FOR THE 70-TON CAR THE 850-LB. CHILLED TREAD WHEEL—THE HEAVIER THE CAR CAPACITY THE GREATER THE FACTOR OF SAFETY.

The chilled tread A.R.A. standard wheel is made in fifty-eight (58) plants in the United States and Canada. These plants have a daily capacity of 20,000 wheels.

CHILLED TREAD WHEELS

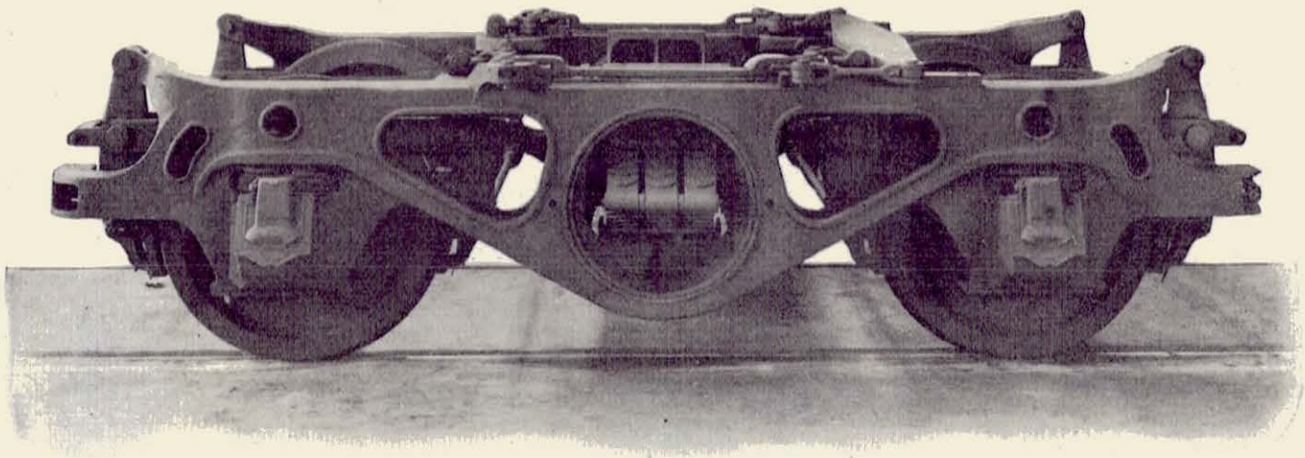
A. R. A. Standards

650-lb. for 30-ton Cars—700-lb. for 40-ton Cars—750-lb. for 50-ton Cars—850-lb. Wheel for 70-ton Cars

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS
1847 McCormick Building, Chicago, Illinois

TAYLOR FLEXIBLE TRUCKS

FOR PASSENGER EQUIPMENT



NEW ENGINEERING PRINCIPLES embodied in the TAYLOR design mark this truck as being one of outstanding merit for use under passenger train equipment—from the standpoint of both safety and exceptionally easy riding qualities.

A mechanically flexible truck.

It combines strong, rugged construction with light weight.

Positive equalization is insured by the design of side frame.

Note that heavy forged equalizers are eliminated.

Reduced vertical impact is effected by this design.

These features coupled with the long spring travel provided, insure remarkably easy riding qualities.

FLEXIBLE TRUCK CORPORATION

314 GANSTER BUILDING READING, PA.

First...

UNKNOWN VALUES

by salesmen for an infant industry

Then...

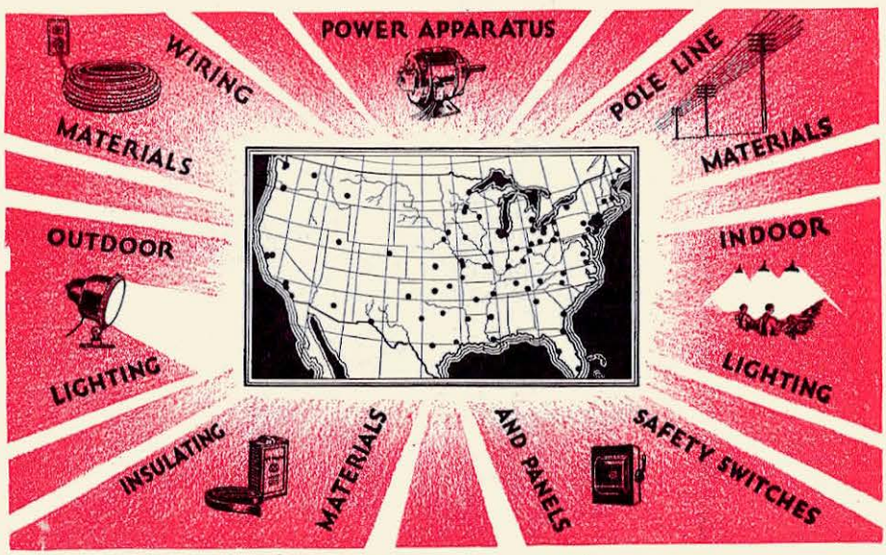
DEPENDABLE PRODUCTS

but distributed through uncoordinated channels

now..

UNQUESTIONED QUALITY

in a complete line of electric apparatus and supplies, immediately available from more than 80 wholesale warehouses, to every community in the United States



GENERAL ELECTRIC

SUPPLY CORPORATION

Commonwealth
SIX WHEEL TENDER TRUCK
EQUALIZED SWING MOTION TYPE

EQUALIZED SEMI-ELLIPTIC SPRING SUSPENSION PREVENTS HARMONIC TENDER OSCILLATION

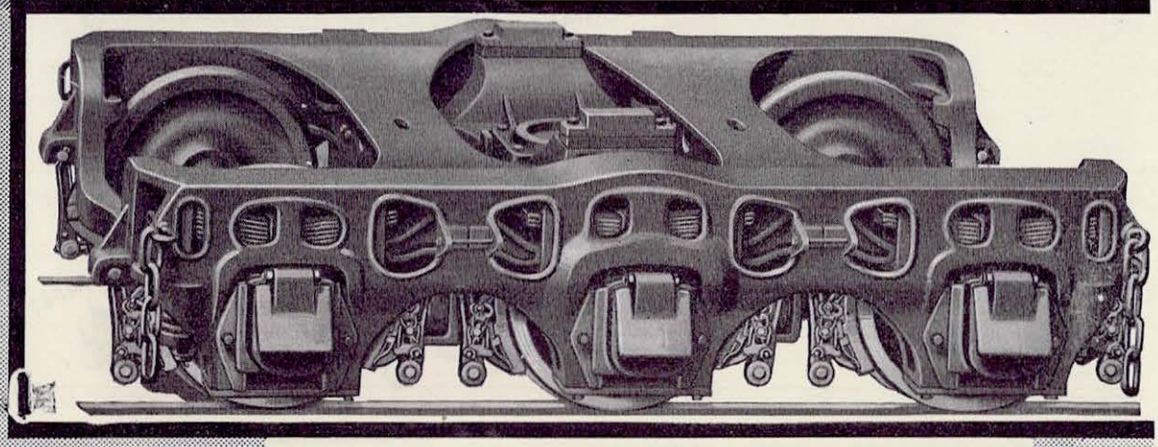
A simple compact truck for tenders of large capacity.

Swing motion bolster prevents rolling and derailment of tender.

Frame including pedestals an integral steel casting.

Brake shoes readily inspected and renewed.

The swing motion arrangement of Commonwealth Tender Trucks functions in a manner to resist side thrust stresses which develop particularly on curves, making the trucks exceptionally easy riding and reducing tender repairs and maintenance to a minimum.



GENERAL STEEL CASTINGS CORP.

GRANITE CITY, ILL. *EDDYSTONE, PENN.*

"STANDARD" FOR DEPENDABILITY

PROMPT shipment of "Standard" products is as much a measure of our service to the Railroad industry as is their stamina under the grueling punishment of service.

STANDARD STEEL WORKS COMPANY

GENERAL OFFICES AND WORKS: BURNHAM, PA.

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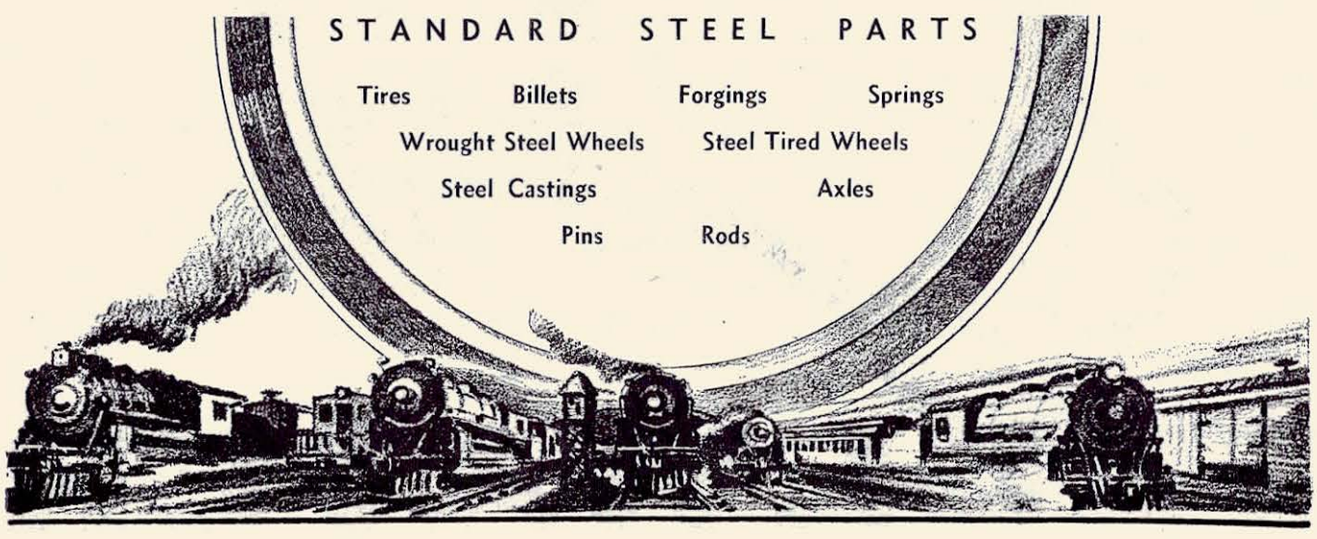
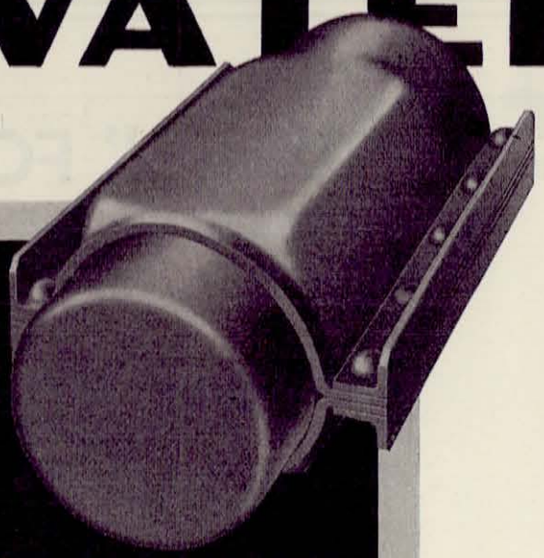
STANDARD STEEL PARTS

Tires Billets Forgings Springs
Wrought Steel Wheels Steel Tired Wheels
Steel Castings Axles
Pins Rods



EDGEWATER

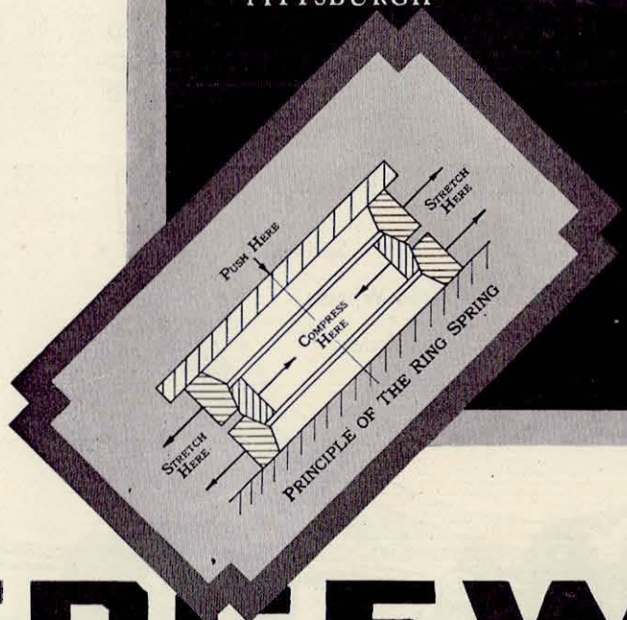


"Equipment PROTECTION not heretofore possible"

RING SPRING DRAFT GEAR

High protective efficiency, obtained by correct spring action—and positive release, is assured by the principle of the Ring Spring Draft Gear—and the high quality of the materials and workmanship embodied in its construction.

EDGEWATER STEEL COMPANY
PITTSBURGH PENNSYLVANIA



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EDGEWATER

Nicholson Thermic SYPHONS

of simple, durable construction, perform primary functions in the efficient operation of locomotives. They have been subjected to numerous, severe tests and the final test made recently by the University of Illinois in the laboratory of its Railway Engineering Department was the most exacting locomotive boiler test ever conducted. The Railway Engineering Department states in its bulletin:

"At all rates of evaporation the Syphon-Equipped locomotive showed a definite and notable superiority over non-Syphon engine as regards both evaporation per pound of coal and boiler efficiency."

Positive protection afforded by Syphons in the prevention of boiler explosions also, has been thoroughly proven and accepted by the Boiler Inspection Department of the Interstate Commerce Commission and by leading railway officials. Bulletin No. 220 University of Illinois will be sent upon request.

LOCOMOTIVE FIREBOX COMPANY
NEW YORK CHICAGO MONTREAL

Increased Circulation

Reduced Boiler Maintenance

Increased Economy

Unfailing Safety

Announcing —

NO-OX-ID
IRON-RUST
TRADE MARK
The Original Rust Preventive

FILLER

For New Railway Cars

Application in Metal to Metal and Wood to Metal Contact Points

Because of the extensive use of NO-OX-ID in building railway cars and the opportunity of developing still greater value in this material for the purpose, the Dearborn Laboratories after a long period of research have perfected NO-OX-ID Filler. It retains all of the remarkable rust inhibitive qualities that have caused over one hundred and fifty railroads and marine interests to adopt NO-OX-ID.

This improved material when spread out thinly on a metal surface and exposed to the air sets up to a semi-hardening and a non-flowing consistency within a few hours.

When this material is excluded from the air, as inside a seam, it does not harden readily but at the immediate point where it is exposed to the atmosphere, becomes a very wonderful seal that will not flow and will take paint readily.

Made in red and gray colors.

The use of NO-OX-ID on both new and old cars has increased in impressive totals during the past few years: in 1925, cars treated 1,025; 1927, 1,950 cars; 1928, 2,310 cars; 1929, 13,440 cars; the early months of 1930—5,708 cars. This new material will still further reduce corrosion and rusting in metal to metal and wood to metal contacts. Investigate NO-OX-ID Filler.

How to Save Spring Breakage

NO-OX-ID "E" is a chemically compounded rust inhibitive and lubricant free from asphalt, sulphur and other impurities. Used between the leaves of banded springs, it both lubricates and prevents corrosion, and overcomes spring breakage to a remarkable degree. Many railroads in the United States and abroad are using NO-OX-ID "E" for treating locomotive, passenger car and motor bus springs. Specify "treated with NO-OX-ID" in ordering steel springs and when considering spring maintenance, let us submit very interesting data with recommendations.

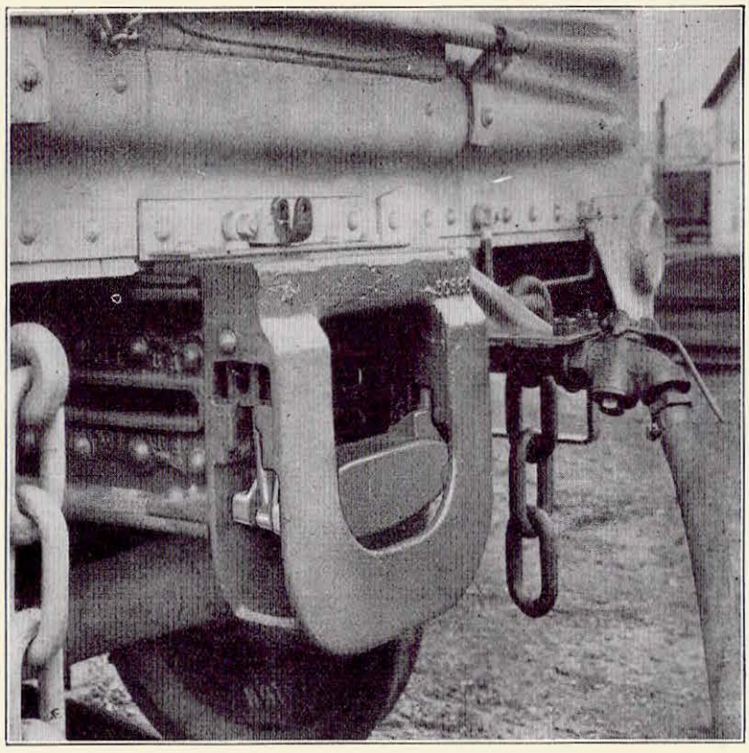
DEARBORN CHEMICAL COMPANY

310 S. Michigan Avenue, CHICAGO

205 E. 42nd Street,
NEW YORK

Dearborn
Trade Mark Registered

Canadian Office and Factory:
TORONTO



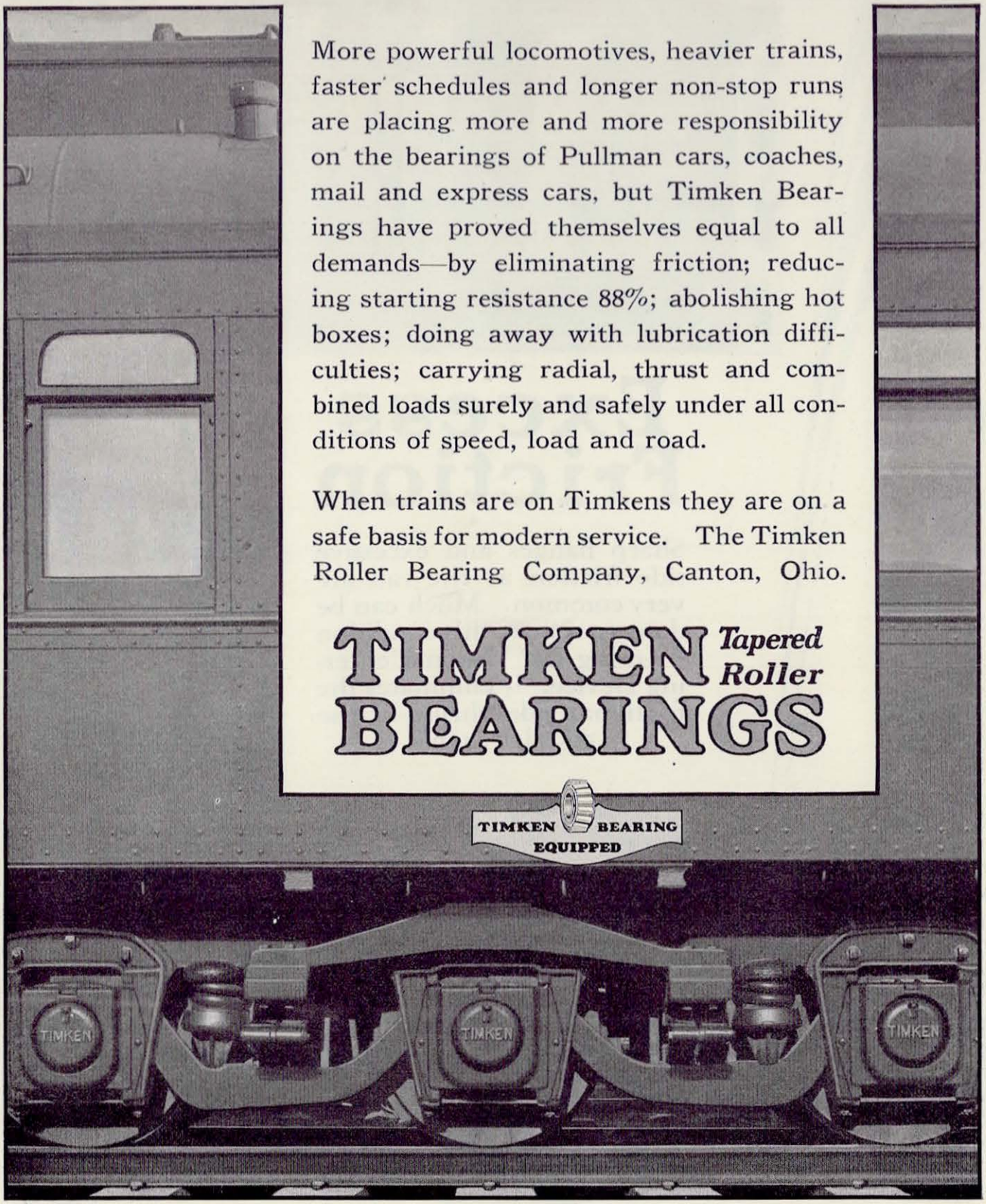
Excess Friction

Sharp flanges and excessive side friction at the rail are very common. Much can be done to relieve this condition by using the Union Centering Device. It eliminates the frictional side thrust of the coupler shank.

UNION METAL PRODUCTS COMPANY

NEW YORK · CHICAGO
ST. LOUIS · WASHINGTON · RICHMOND
SAN FRANCISCO · KANSAS CITY
HOUSTON · MONTREAL

THE BASIS OF MODERN TRAIN SERVICE



More powerful locomotives, heavier trains, faster schedules and longer non-stop runs are placing more and more responsibility on the bearings of Pullman cars, coaches, mail and express cars, but Timken Bearings have proved themselves equal to all demands—by eliminating friction; reducing starting resistance 88%; abolishing hot boxes; doing away with lubrication difficulties; carrying radial, thrust and combined loads surely and safely under all conditions of speed, load and road.

When trains are on Timkens they are on a safe basis for modern service. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**

Universal

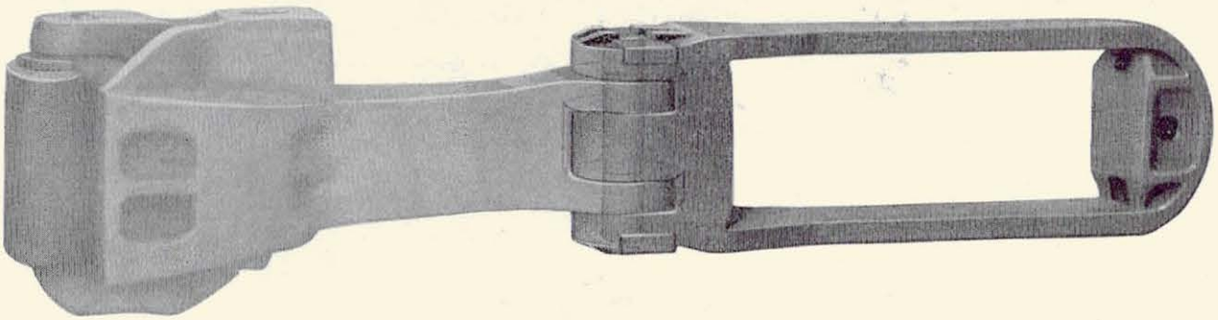
PIVOT YOKE

FOR

LOCOMOTIVES

AND

FREIGHT CARS



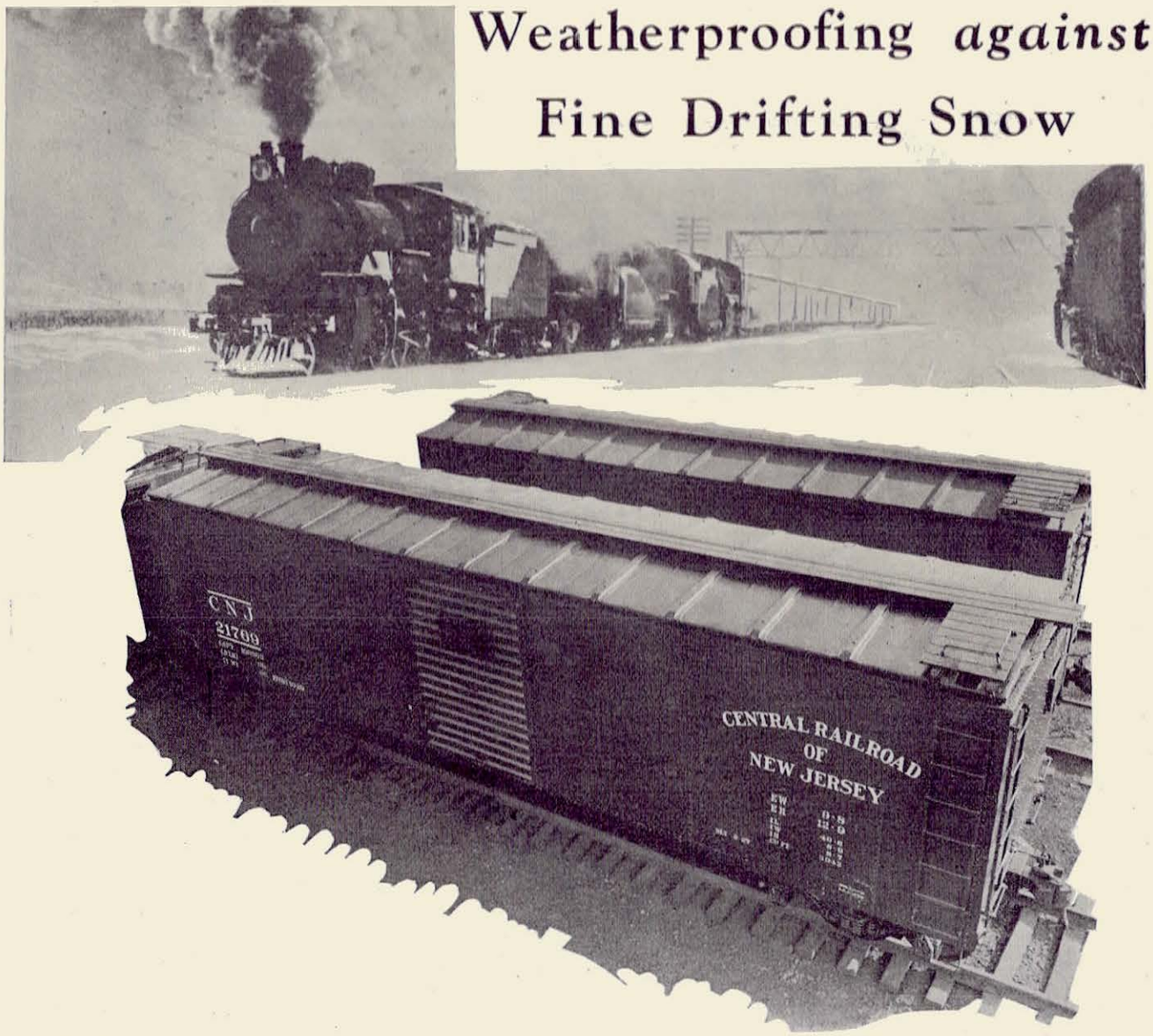
SUITABLE FOR ANY
A. R. A.
CONSTRUCTION

Universal Draft Gear Attachment Co.

332 S. Michigan Avenue, Chicago

Royal Bank Building, Montreal, Canada

Weatherproofing *against* Fine Drifting Snow



SAFE transportation means more than just safety on rails. It requires the absolute protection of the lading against the elements and protection of the railroad against damage claims. Fine drifting snow, hard driving rains, freezing and thawing have no effect upon the

UNIVERSAL
Dry Lading All-Steel Roof

nor upon the lading of the car. The Universal *is* weatherproof and *stays* weatherproof.

The roof sheets are flexibly connected with each other and with the car structure. Unlike the riveted roof, these flexible joints allow for vibration, so that the sheets will yield and not bulge or break under strain.

Flexibility which assures lasting weatherproofing is only one of a thousand different reasons why the Universal Dry Lading Roof is the outstanding improvement in car construction history.

HUTCHINS CAR ROOFING COMPANY
DETROIT MICHIGAN
Established 1880

The Transportation Problem—A Chicago Illustration

The advocacy by the railroads of increased regulation of their competitors has called forth from various sources, as has been pointed out in the *Railway Age,* the suggestion that the solution of the nation's transportation problem is to be found, not in increased regulation of other means of transportation, but in reduced regulation of the railroads. This raises questions as to whether those who propose a reduction of railway regulation are really in favor of it, and, if so, as to how much and in what ways they are in favor of reducing regulation.

The Chicago Tribune is an aggressive exponent of the view that regulation of railways should be reduced, rather than that regulation of other means of transportation should be increased. Will its editorial policies stand the test of consistency? Does it really favor a reduction of railway regulation? And if not, are others who say they favor it any more consistent?

Bus Transportation "More Economical?"

In an editorial published in its issue for January 23 the Tribune referred to the bill pending in Congress for the regulation of interstate operation of motor buses, remarked that "if the bus is actually a more economical means of transportation than the passenger coach, the effort (to secure interstate regulation) is hardly deserving of praise," and added: "Regulation of the railroads as at present practiced has resulted in the stifling of initiative on the part of railroad managements, which in turn is to no small extent responsible for the present unfortunate condition of the railroads. The extension of the regulatory system to cover bus lines will reduce the bus companies to the same level of impotence. Bus service will suffer and the public, which has patronized the railroads' competitors because they were giving more satisfactory transportation, will have to pay more for an inferior article. The railroads' difficulties will not be solved by regulating the bus companies, but by freeing the railroads of the evils of overregulation."

At the time this editorial was published there was pending before the Illinois Commerce Commission a proceeding instituted by the Chicago Tribune to compel the railways to electrify their terminals in Chicago, and to erect two or more large new passenger stations in that city. The issuance by the commission of an order in compliance with the Tribune's petition would be a very extreme example of attempted exercise of the power of regulation. If the order were upheld by the courts, it would compel an expenditure amounting to several hundreds of millions of dollars.

The Tribune says, "If the bus is actually a more economical means of transportation than the passenger coach," etc. If it is, one of the most important reasons is the difference between the terminal costs of buses and railways. The most important part of the terminals used by buses operating to and from Chicago are the streets in the loop district, which are located upon some of the most valuable land on earth. If the operators of the buses had to pay for the use of this land in proportion to its value, their rentals for terminals probably would be so enormous that they could not enter the loop district.

The railways do not use land in the loop for terminals. They use land, tracks and stations owned by themselves. One of the reasons why railway terminal properties in Chicago already represent so large an investment as they do is that the city has compelled the railways to spend many millions of dollars in elevating their tracks. The Tribune demands, as already indicated, that they shall enormously increase the investment in their Chicago terminals. For what purpose? To make the passenger coach a "more economical means of transportation?" To increase the percentage of return earned by the railways upon their entire investment? In the opinion of railway executives and engineers the inevitable effect would be to increase the interest upon the investment of the railways in their Chicago terminals many times more than it would reduce their operating expenses, and thus tend to make it harder for the passenger coach to compete with the bus.

The Tribune may answer that railway officers are wrong—that the enormous capital expenditures demanded will benefit the railways—and that, therefore, they should be forced by the Illinois Commerce Commission to make the expenditures it demands. Of course, however, if the Tribune makes this answer as to this specific case it thereby repudiates completely the general policy of regulation of railways which it advocates. That general policy is the restoring of initiative to railroad managements. This can be done only by giving railroad managements more freedom to act in accordance with their own best judgment; but what the Tribune demands is that the judgment, not of railroad managements, but of the Illinois Commerce Commission, shall determine whether hundreds of millions of dollars shall be spent upon terminals in Chicago. Obviously, it is not advocating a reduction of railway regulation when it calls upon the government to use in a new way its power of regulation for the purpose of compelling the railroads to make these huge capital expenditures.

The question raised by the Tribune's suit before the Illinois Commerce Commission is much broader even than the foregoing comments would indicate. The railroads serving Chicago serve a territory which includes all of Illinois, most of the other states of the union and a large part of all the country's great cities. These railways have not unlimited ability to raise new capital. To leave initiative to their managements would be to let them decide how their capital expenditures shall be apportioned among all the communities, large and small, that they serve; while the demands made by the Tribune in its suit are such, that, if they were complied with, the capital expenditures made in Chicago would be so large that for a long time the railways concerned would be unable to invest as much in other places in Illinois and in communities in other states as they otherwise would be able to.

Finally, the huge expenditures demanded in Chicago are demanded and actually would be made almost solely for the benefit of the people and business interests of Chicago—that is, to beautify that city in accordance with the plan of the Chicago Plan Commission; to give employment to its labor; to increase the value of real estate within its limits, and to increase the amount of its taxable property. It is no part of the scheme, however, to so readjust passenger and freight rates that the people and industries of Chicago will pay the entire return upon the investment made for their benefit. This return would be collected in passenger and freight rates from all the people throughout most of the United States that are served by the railways entering Chicago.

An Obvious Inconsistency

Railway passenger business is constantly declining, but Chicago demands a huge increase in the investment of the railways within Chicago to handle this declining business. Chicago is a leader in the middle west in demanding large government expenditures upon waterways to "cheapen transportation"; but by the huge proposed expenditures in Chicago the cost of railway transportation throughout most of the country would be increased.

The inconsistency of the Chicago Tribune in bringing a suit to secure one of the most extreme and unjust exercises of the government's power of railway regulation ever proposed, and, in advocating, at the same time, reduced regulation of railways rather than increased regulation of other means of transportation to solve the country's transportation problem, is obvious. Are all the other persons and newspapers that are advocating the same policy more consistent?

If the *Railway Age* were sure that all these persons mean what they say, and if we believed in the practicability of securing a substantial reduction of railway regulation, we would join in advocating that policy. We would rather see railway regulation reduced than regulation of other means of transportation increased. The vitally important thing to be attained, however, is equalization of government policies affecting the railways and other means of transportation. We do not believe it is possible to attain this through reduced regulation of railways because there is no evidence of any substantial public sentiment in favor of this policy. We apprehend that even most of those who are advocating it are doing so mainly or solely to prevent increased regulation of other means of transportation, and would, like the Chicago Tribune, advocate any increase of railway regulation that they believed would be beneficial to them or their communities, almost regardless of its effects upon the railways or upon other persons or communities.

When the Chicago Tribune drops its suit before the Illinois Commerce Commission the *Railway Age* will be convinced that it really believes in reducing railway regulation and restoring initiative to railway managements. Until those who oppose increased regulation of other means of transportation actually begin a movement to secure specific and substantial reductions of railway regulation, this paper will continue to believe that the only practical means of securing equalization of treatment of different means of transportation is by securing increased regulation of other means of transportation.

Characteristics of Modern Locomotives

The Chesapeake & Ohio road tests, an account of which appeared in the January 17 issue, present a clear-cut demonstration of the possibilities for capacity and economy offered by modern features of locomotive proportioning and design. The value of the demonstration is greatly enhanced by the fact that the newer locomotives were directly compared with a class of power which has given a splendid account of itself and which represents some of the best design embodied in its type.

The new locomotive has a single-unit 10-coupled driving-wheel base operated by two 29-in. by 34-in. cylinders, with steam at 260 lb. pressure, and a trailer booster. The older locomotive has two eight-coupled driving units, each operated by two 23-in. by 32-in. cylinders, with steam at 205 lb. pressure. The new locomotive weighs approximately two tons less than the old locomotive and carries about fifty-nine tons less on its driving wheels. Its boiler, with 3 ft. shorter tubes, contains 2.3 per cent more evaporating heating surface but, with its Type E superheater, its combined evaporating and superheating surface is 15 per cent greater. Both locomotives have unusually large grates, but the 121.7 sq. ft. in the grate of the new locomotive is nearly 8 per cent larger than the grate in the older locomotive. Both locomotives are equipped with feedwater heaters.

The test performance of the two locomotives indicate a remarkably close parallel as to tractive capacity at all speeds. The new locomotive, with its adhesive capacity limited to the weight on five pairs of coupled wheels, develops a starting tractive force of 91,584 lb. with the main cylinders, while the articulated locomotive, with eight pairs of drivers, develops 103,500 lb. As the speeds increase, however, the tractive force of the new locomotive decreases less rapidly than that of the older locomotive and the lines cross at about nineteen miles an hour, the new locomotive apparently developing something over 1,000 lb. more tractive force than the older locomotive as the speeds increase from twenty to thirty-five miles an hour. It is interesting to note that with the trailer booster in operation the tractive force of the newer locomotive is increased so that it is also slightly greater than that of the older locomotive as the speeds increase up to about fifteen miles an hour. During this range the booster brings into use an additional 66,000 lb. of adhesive weight which is involved during a relatively small part of the total time the locomotive is in operation. It is this slightly higher tractive capacity throughout practically the entire speed range of operation which accounts for the fact that during the tests the newer locomotive handled trains averaging about two per cent greater in tonnage with a slightly reduced net running time. Using Cole's ratios as a basis of comparison, the capacity of the boiler of the new locomotive is practically 20 per cent greater than that of the older locomotive, based on the assumed cylinder demand. The value of this and of the larger grate is reflected in the fact that 11 per cent more of the total heat units available in the coal fired is actually delivered in useful work at the drawbar in the new locomotive, than in the old.

But one of the advantages of the new locomotive, with its simpler machinery and more rigid construction, cannot be measured in road performance. This is a probable decided decrease in the cost of maintenance per 1,000 gross ton-miles of traffic movement. Final evaluation of this advantage must wait until the new locomotives have been through the shop for Class 3 repairs.

Removing Second Track

During the last few years 220 miles of double-track main lines on railroads in Ireland have been converted to single track, as described in a series of three articles published recently in the Railway Gazette of London. The savings thus effected and the success of the new methods of handling trains on the single-track lines naturally leads to the thought that perhaps certain sections of double track in the United States might well be converted to single track.

The program of single-tracking in Ireland was started as an emergency measure during the World war when sections of second track were removed and the materials sent to France. Following the war, numerous other short sections of second track were removed until the total had reached 69 miles by 1928, at which time considerable public opinion was aroused for fear that further conversion would cause delays to train service. However, as seven other sections, totaling 105 miles on the Great Southern, have been single-tracked since that time, it would seem that the opposition had lost interest, and that the service rendered on these single-track lines is satisfactory.

The most extensive continuous section of double track that was converted to single track is on the Great Southern from Clonsilla, near Dublin, to Ballinasloe, a total of 80 miles, this being a portion of the main line from Dublin to Galway, which handles a traffic of approximately 20 trains daily on the greater portion of the territory. With the change to single track, signaling was provided for operation of trains under manual block controlled by the staff system for directing train movements between passing sidings, which are handled by mechanical interlockings, spaced from four to seven miles apart. However, the details as to the interlocking and staff system are of little interest to our readers, for under similar circumstances the centralized traffic control system would be used in America.

As to the economy to be accomplished by reducing the trackage, the annual report of the Great Southern for 1929 states that a reduction in expenditures of $893,460 as compared with 1928, was in part due to "eliminating non-earning portions of the companies property, that is to say, by not maintaining two lines where one, with the new device now available, more than suffices for the efficient discharge of business offered or likely to be offered."

The traffic on certain double-track lines in the United States has been reduced for various reasons to such an extent that the present business, as well as that expected in the future, could well be handled on a single-track line, if equipped with improved systems of directing train movements by signal indication. The first extensive installation of centralized traffic control was placed in service in 1927 on 40 miles of single track on the New York Central, and recent reports indicate that the traffic capacity has been increased approximately 40 per cent, as high as 55 trains being

handled daily without delay, and without approaching the capacity of the line. The savings in operating expenses represent 24 per cent on the investment for track changes and signal improvements, and if the interest on the investment that would have been required for second track is considered, the total saving being made represents 65 per cent on the expenditure for signaling improvements and track changes.

In view of the fact that reliable and economical methods of directing train movements by signal indication are now available, it would seem that the American railroads have a lesson to learn from the Irish railways, i. e., that where traffic does not warrant the maintenance of two tracks, studies should be made to determine the economics of removing one track and providing centralized control on the remaining track.

Running on Other Roads

One of the subjects selected for report at the next convention of the Superintendents' Association is the consideration of the train rules applicable when operating over other railroads. The standardization of train rules under such circumstances is of vital importance, but an even broader consideration of the subject is necessary.

Probably no single phase of operation produces so much misunderstanding and laxity of supervision as this one. The operation of trains through heavy traffic terminal districts, for instance, requires absolute familiarity on the part of the crew with the train rules, particularly since the rule governing the operation of trains through yards is construed differently on various railroads. A complete and detailed acquaintance with the physical characteristics, such as signal and switch locations, is also an imperative necessity, yet there are frequent instances of unqualified men operating trains over foreign lines without pilots.

A recent instance illustrates the point rather aptly. An engineman of one line, who was unqualified to operate over another line, none-the-less took an interchange cut over that line. On his first trip of the day, he got by all right, but, on returning with another cut, he ran his train by a signal and collided with a standing train, resulting in his own death and the injury of two other employees. Investigation developed that the conductor called an operator of the other road before making the trip and gave him the register of the crew. From this point, the testimony differed. The operator claimed that he did not authorize the running of an unqualified engineman; the conductor says he did. It does not matter which one is telling the truth; the opportunity for a situation such as this should not be permitted to exist.

This is but one of a number of similar misunderstandings. Usually, they do not result quite as unfortunately, but the danger is always there. Similar accidents might be avoided if the officers in charge were to investigate each such operation under their control, and see just what is being done in each case.

What Charge for Road Use for Gain?

Taxes on commercial users of the highways are a complete hodge-podge, with wide variations from state to state. In some states they are relatively high and in others absurdly low. Some attempt has been made to base taxes on the extent of use, but in no case has the problem been approached scientifically with the idea of assessing these vehicles the full rental value of the public property they use, over and above the levies on them for ordinary governmental purposes.

Propagandists for the commercial highway carriers have attempted to make it appear that the railways are striving to "restrict the movement of 26,000,000 private cars, trucks and buses over the public highway." Such an assertion is plainly ridiculous. As a matter of fact, if commercial users of the highways should be required to pay more adequately for the public property they use, the tax burden on private motorists and light farm and local delivery trucks could be reduced.

A concrete plan for exacting a fair rental for use of the highways by heavy motor vehicles has been outlined by F. J. Lisman, and appears on another page of this issue. We believe that it contains all the elements of a fair plan and, as such, merits careful study. Most importantly, it clearly distinguishes between taxation and rental, which is the first step toward clarification of the prevailing complexity.

Mr. Lisman's plan does not embrace light vehicles—whether they are used commercially or not. It would therefore, work no hardship on owners of private automobiles or light farm or delivery trucks. Heavier vehicles, however, would be required to pay a certain rate per mile, the rate increasing with the weight of the vehicle. On this basis local vehicles which do not travel great mileages would be favored as against the heavy long-distance vehicles traveling, some of them, hundreds of miles daily. Mr. Lisman points out, moreover, that vehicles operating entirely within the limits of one locality might be freed of any additional levies if it were felt desirable to exempt them. Whether this were done or not, however, his plan would not bear heavily on local transport because of the low mileage traveled by such vehicles.

The plan should appeal strongly to private motorists, operators of light trucks, and bus and truck operators in local service who find their taxes increasing each year by reason of an unscientific and inadequate basis of charges upon those whose vehicles are both heavy and travel great mileages.

I. C. C. Proposes

New Rate-Making Law

Report to Senate committee calls Section 15a impracticable and recommends more flexible fair return on rate base

By Harold F. Lane

Washington Editor, Railway Age

WASHINGTON, D. C.

EVENTS appear to be gradually, if slowly, tending toward a new Transportation Act of, say, 1932, or 1933. The Interstate Commerce Commission's recommendation for a repeal of the rate-making rule of the 1920 act, on which railroads and investors have pinned their hopes for ten years, will doubtless cause as much furor in transportation circles as the report of the Wickersham prohibition commission on another "noble experiment" did in general circles, although the I.C.C. has convinced itself that the law can be repealed without the necessity of discussing any change in the Constitutional provisions back of it.

Section 15a Impracticable

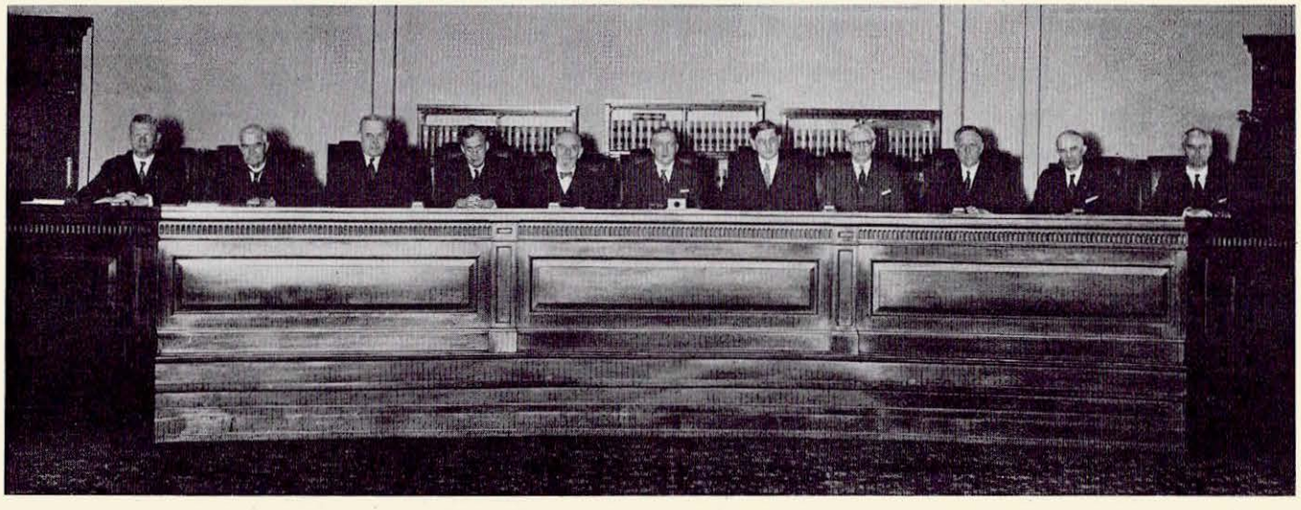
After ten years of confessed failure to comply with the fair-return-on-value standard, while waiting in vain for the growth of traffic to accomplish the result without increases in rates, the Interstate Commerce Commission has finally announced the opinion that the rate-making rule of Section 15a, "although sound in principle" is "in certain respects impracticable." It also reiterates the recommendation made in its annual report for the repeal of the recapture clauses of Section 15a, which it has tried to enforce but in a way condemned by the Supreme Court.

The commission finds not only that the present law tends to "cramp its style" but that under it the railroads have "never been able, since 1920, to obtain the aggregate earnings contemplated by section 15a" and it recommends a new deal which undoubtedly possesses many advantages from its standpoint. The effect of its proposals on the earnings of the railroads would depend, as has been the case under the existing law, largely on the discretion of the commission with the Constitution somewhere in the background.

Asks "Statutory Guide"

As a substitute for the rather specific rule of 15a, it suggests a statutory "guide" which would make it the duty of the commission to maintain "so far as possible" a general level of rates which "over a period of years" and "under normal conditions" will produce "as nearly as may be" a percentage of fair return to be prescribed by it from time to time, on a "rate base," intended to reflect approximately the investment in carrier property. The rate base would be built up from the primary valuations at 1914 prices by accounting processes covering the net additional investment and depreciation.

This is the plan proposed in the Howell bill, S. 4005, with some changes suggested by the commission, following in general the O'Fallon method of valuation which Senator Howell sought to legalize after it had been condemned by the Supreme Court. The commission's views were expressed in a supplementary report on the Howell bill, addressed to Chairman Couzens of the Senate committee on interstate commerce on January 21 and made public by the commission on January 24. The report is signed by Commissioner Eastman as chairman of the



Underwood & Underwood

Latest Photograph of the I. C. C. As at Present Constituted on the Bench in Their Hearing Room at Washington

Left to right: Commissioners Hugh M. Tate, P. J. Farrell, Frank McManamy, J. B. Eastman, B. H. Meyer, Ezra Brainerd, Jr., Chairman, C. B. Aitchison, E. I. Lewis, C. R. Porter, W. E. Lee and C. D. Mahaffie.

legislative committee of the commission, who said he had been authorized to express its views.

Thus the entire membership of the commission, although five of them express reservations and one some doubt on the subject, has finally concurred in recommending the adoption of a rate base not much different from the "prudent investment" basis so long advocated by Commissioner Eastman, who in 1920 declined an election as chairman of the commission on the ground that he had opposed the enactment of the new law it was then beginning to administer.

Howell Bill Rewritten

The commission, or Mr. Eastman, has now rather run away with the Howell bill, which it has rewritten on a skeleton of the bill, and although its recommendations have not yet been formally introduced in bill form they naturally have a more important status than any bill not reported by a committee. In two previous reports it has expressed general concurrence with the plan of the Howell bill, and it now suggests further changes and eliminations, including an amendment to the valuation law under which it would continue to keep informed of changes in carrier property but would not ascertain or report new valuations except when it has occasion to make use thereof.

Congress seldom responds with alertness to the recommendations of the I.C.C. and its committees on interstate commerce have so long been engaged on other matters that their members are rather out of touch with the discussion of the rate-making rule, which has been conducted during the past year in written communications to the Senate committee, but it is believed that the commission has finally formulated a plan calculated to appeal to Congress, particularly as it harmonizes in general with those of the National Industrial Traffic League and the state commissions, while the burden of opposition will be upon the railways and the constitutional lawyers.

Proposed Substitute for 15a

As an indication of what it has in mind the commission submits the following, as a substitute for provisions in the Howell bill proposed in place of the present section 15a:

As a guide in adjusting the general level of rates, in the exercise of its power to prescribe just and reasonable rates, the commission shall from time to time determine and make public what percentage of the aggregate of the contemporaneous rate bases of the operating carriers constitutes a fair return thereon. In making such determination it shall give due consideration, among other things, (1) to the present and reasonably prospective transportation needs of the country, (2) to the necessity, in the public interest, that the carriers shall be able to establish and maintain a credit sufficient to attract the capital required to meet these transportation needs, and (3) to the necessity, in the public interest, that the carriers shall furnish transportation service to shippers and travelers at the lowest rates consistent with adequate service and the meeting of the transportation needs. Having determined such fair return, the commission shall endeavor to adjust the general level of rates so that operating carriers as a whole (or as a whole in each of such rate groups or territories as the commission may from time to time designate) will under normal conditions and under honest, efficient, and economical management and reasonable expenditures for maintenance of way, structures, and equipment, earn an aggregate net railway operating income equal, as nearly as may be, to such fair return. The fact that such aggregate net railway operating income falls below such amount in times of economic depression or rises above it in times of economic prosperity shall not necessarily be regarded as a reason for raising or reducing rates, as the case may be; but the duty of the commission in the exercise of sound discretion shall be to maintain so far as possible a general level of rates which over a period of years will produce earnings consistent with the principles, above set forth, to be observed in the determination of the fair return; and the commission shall initiate, modify, establish, or adjust rates to the extent that it may find necessary in the full performance of the foregoing duty.

Economic Conditions To Be Recognized

"The necessity that the carriers shall be able to establish and maintain adequate credit is emphasized in this substitute," the commission says, "but the part which general economic conditions play in railroad revenues is also recognized, and no attempt is made to govern the action of the commission by any rigid and mathematical formula." It seems to the commission desirable that it "should have more lee-way" in following the "barometer of earnings" as a guide and that fluctuations in net income in good or bad years should not necessarily be regarded as a reason for raising or reducing rates. The commission also desires a standard more readily ascertainable than a controversial valuation.

The effect on the rate level of the proposed basis would depend in part on the percentage adopted, which would be stated as a percentage of a rate base rather than that of a valuation, but the commission indicates an intention to see that it is sufficient to escape condemnation by the courts as confiscatory, and five lawyer members of the commission indicate that they assented to the plan only on that understanding. While recognizing that the determination of value is a judicial process, the report says that rate-making is a legislative function and need not be based on value provided the result is such as to allow a non-confiscatory return. But the proposed amendment would direct the commission to prescribe a percentage of the aggregate rate base which would be a fair return "*thereon.*" Possibly it is this language which Commissioners Farrell, Lee and Tate feel should be improved to make the rule consistent with the avowed purpose to keep above a confiscatory level.

Aggregate net railway operating income is now "far below the level contemplated by Section 15a," the commission says. "In such circumstances it would seem to follow, under the formula of that section, that immediate steps should be taken to bring about a substantial increase in rates. Yet no such steps have been taken," and it adds that the result would probably expose industrial conditions to another severe shock and that apparently this has been the view of the carriers for they have not undertaken to initiate increases in rates nor asked the commission to exercise its authority in this direction. It is not stated that the railways instead of asking for increased rates have asked the commission to refrain from ordering further reductions in rates.

While the commission indicates no particular desire for authority to reduce the present rate level, it does refer to the increasing competition of other forms of transportation and cites the opinion expressed when it reduced rates in 1922 that lower rates might give the carriers fuller assurance of a fair return than higher ones. A rate base built up along the lines suggested would probably be found to be somewhat below the property investment account of the railways, now about $25,000,000,000, on which their net return has ranged from 2.84 per cent in the depressed year 1921 to 4.98 per cent in the prosperous year 1926. Since the new rule proposed by the commission would offer it a whole series of qualifying phrases in addition to the saving words "as nearly as may be" in the existing law, it seems to offer no particular assurance to the railways that the commission would find it any more practicable in the future to find "reasonable" rates which would produce a fair return even on a rate base, except that it might find it somewhat easier to accept the results of its own formula than those of the carriers' claims.

The supplementary report was submitted in response to a request for a discussion of various comments on the Howell bill sent to the committee on behalf of the Association of Railway Executives, the National Industrial

Traffic League, the National Association of Railway and Utilities Commissioners, and others. The latter two organizations recommended repeal of Section 15a in its entirety, including the recapture clause, condemning it as "economically unsound," and the commission's recommendation in a general way follows their reasoning, although the N.I.T.L. expressed the opinion that the "rate case" as a substitute for value would be subject to all the legal objections found to apply to the O'Fallon valuation, and both opposed any percentage rule of rate-making.

Alfred P. Thom, general counsel of the Association of Railway Executives, had opposed the Howell bill on the ground that the ascertainment of value is a judicial process and that the rate base plan represents an unconstitutional method for basing rates on something avowedly less than value. The commission, however, referred to another statement by Mr. Thom that "many think that rates, instead of being ascertained by reference to values of property or rate bases, are the product of commercial and economic conditions" and said that a close reading of his communication indicated a distinction in his mind between the use of a rate base for determining the general level of rates and its use for purpose of recapture, which it now proposes to put out of the picture.

Recapture Eliminated

One of the commission's reasons for recommending repeal of the recapture provisions, as given in its annual report and repeated to the Senate committee, was the fear that the railways in contesting recapture might get established a valuation too high to be used in rate-making. As an additional reason it now says to the Senate committee:

> In addition, it may be said that even in theory the need for recapture is not now so impressive as perhaps it appeared when the plan was first formulated. The railroads have never been able, since 1920, to obtain the aggregate earnings contemplated by section 15a, and they are faced with continually increasing competition from other forms of transportation. Moreover, differences in earnings between individual carriers seem likely to be materially lessened by the gradual progress of unification, and our power over divisions of joint rates affords a means of adjusting earnings to some extent as between strong and weak lines.
>
> Furthermore, certain railroads which have an enviable reputation for financial strength owe this strength to the fact that they are undercapitalized in comparison with the values of their properties, and vice versa certain railroads which are weak financially owe their weakness to overcapitalization. Because of this situation there are many strong railroads which are in little or no danger of recapture, whereas it threatens various railroads which are weak.

Commissioners Unanimous for Revision

Like the recent report of the Wickersham commission, whose eleven members failed to assent to all of its findings, this report on behalf of the commission is accompanied by reservations or separate opinions on behalf of seven of the eleven commissioners. However, unlike the prohibition commissioners, seven of whom seemed to agree that the prohibition measures should be either repealed or revised, yet signed a report recommending continued efforts to enforce them, the Interstate Commerce Commissioners are unanimous in recommending a revision of Section 15a, and not one of them dissents from the reiterated statements in the report that it has not been enforced and that it would be impracticable to try to.

A resumé of experience under the law is given to show that once, in 1920, when only four of the present members were commissioners, the commission tried to comply with it by approving a very large horizontal increase in rates designed to provide the return contemplated. But soon a depression set in and the return was not realized and the commission has not since felt warranted in initiating or approving any further horizontal increases in rates. Until the depression fell upon the country in 1929 it apparently lived in hope that the "reassuring improvements" in railroad earnings and credit would make drastic action on its part unnecessary and now it feels that it has in the inaction of carriers justification for its own view that rates should not now be increased. Its new yardstick, therefore, is intended to apply to "normal conditions."

Although there was no dissent from the conclusions of the report, six members of the commission—a majority, seemed unwilling to place too much reliance on the "rate-base" theory as a proper substitute for a valuation.

Five Lawyer Commissioners Think Value the Criterion

Five lawyer members of the commission, while concurring in the views expressed, think that regardless of the statute the courts will determine whether the rates fixed do provide a fair return upon the reasonable value of the property and that, as Chairman Brainerd said, "it is the result and not the method that is of constitutional importance," while Commissioner Lewis warned against abandonment of the valuation work, on the ground that the time may be approaching when the investment basis will exceed the replacement cost basis, and that the commission should keep its valuation weapon ready to use if the attitude of the carriers should make it necessary. "Until tests in the courts have established that a rate base such as here proposed meets constitutional requirements, the public interest should not be jeopardized by any relinquishment of the protection that it now enjoys," he said. "This lies in the possession of that information specified in 19a (f) and by an organization to meet any contingency." The report, however, expresses the view that a Congressional rate-making standard need not depend upon value provided the combined effect of the application of a prescribed percentage of fair return to the rate base is not such as to result in confiscation. For this reason none of the commissioners found it necessary to propose the repeal of any amendment to the Constitution, as did some of the prohibition commissioners.

Rate Basis Would Be What I. C. C. Thinks Traffic Will Bear

Experience of the past, together with the fact that the commission describes its proposed percentage on rate base as a "barometer" rather than as a yardstick, will probably incline railroad men to believe that the proposed rule really means a "what the commission thinks the traffic will bear" rule, and that the barometer while going up will be taken as an indication that rates are high enough but while going down as a sign that it is too late to raise any rates. And if this does not satisfy the carriers they may make their own valuations and take them to court to show they are receiving less than the Constitution warrants.

While repeal of the recapture clause would free some funds now held by certain roads as a reserve against possible recapture, the only amount that could be refunded would be the $10,000,000 or so already collected by the commission, mostly from the smaller roads. The commission has increased the interest of the appropriation committees in the valuation work by pointing to an estimate of $254,000,000 as the possible recapturable income of 298 roads since 1920, but Commisioner Lewis was careful to point out that this esti-

mate was made on the O'Fallon basis. However, the House appropriations committee used this figure in reporting the bill for the I. C. C. appropriation without mentioning this qualification.

It is noted that the commission's report to the Senate committee was sent while it was in the midst of considering a mass of tentative or proposed recapture reports proposed by its Bureau of Valuation in which an effort had been made to comply with the Supreme Court's opinion in the O'Fallon case by averaging estimated original cost and cost of reproduction, both less depreciation.

An abstract of the commission's report to the Senate committee follows:

Shall 15a Be Abolished?

The question thus raised with reference to the repeal of section 15a in its entirety deserves most serious consideration. In the administration of this provision we have been obliged to proceed with incomplete information as to the aggregate value of the property and to rely upon estimates. We have no hesitation in saying that if, in bringing valuations up to date, we must continually redetermine, and reappraise on the basis of current conditions, and reweigh all of the elements of value, as they are termed, which have been specified in the decisions of the court or are set forth in section 19a of the interstate commerce act, the process of valuation will always be far in arrears and we shall never have more than a rough estimate of aggregate value ready for current use in the administration of section 15a. On the other hand a plan, such as is provided for in S. 4005, which will make it possible to build up an aggregate rate base from the original valuations by some accounting process, will meet the practical necessities of section 15a, assuming that the formula for the determination of the general rate level which that section provides is otherwise capable of practical application.

Present Rule Called Incapable of Practical Application

But is that formula capable of such application? A resumé of our experience with it will throw light upon that question. Within six months after the enactment of the Transportation Act, 1920, we approved very large horizontal increases in rates designed to provide the return contemplated by section 15a upon our estimate of aggregate value. Business and traffic conditions were then good. Soon afterwards a depression set in, so that the return was not realized. Two years later, in 1922, after conditions had begun to improve but while the return of the railroads was still deficient, we ordered a 10 per cent reduction in rates.

It will be noted that we found it necessary to take into consideration existing industrial conditions and the effect of freight rates on the movement of traffic, and to forecast the future as best we could. On the evidence before us, we did not feel warranted in determining the general level of rates in any automatic way by the mere application of a mathematical formula to the then existing earnings of the railroads.

In general, the results which followed justified, we believe, the conclusions then reached. In the ensuing years, up to the beginning of the financial depression in the fall of 1929, the earnings and credit of the railroads in most sections of the country steadily improved, so much so that considerable financing was done through new issues of stock. Nevertheless, the aggregate earnings in the country as a whole, and in general in the various groups, did not rise to the level contemplated by the statute, even on the basis of our estimates of aggregate value, which did not reflect in any substantial measure the current costs of reproducing the existing railroad properties. The continued improvement in railroad earnings and credit, however, was sufficiently reassuring so that we did not feel warranted in initiating, or approving any further horizontal increases in rates. While disturbances in the stock market were anticipated by many, there was no such anticipation of any serious and prolonged business depression.

Such a depression, however, fell upon the country in 1929, continued throughout 1930, and still exists. The effect of this disturbance, which is world-wide in scope, upon railroad traffic and earnings has been profound, with the result that aggregate net railway operating income is far below the level contemplated by section 15a. In such circumstances it would seem to follow, under the formula of that section, that immediate steps should be taken to bring about a substantial increase in rates. Yet no such steps have been taken. The result would probably be to expose industrial conditions to another severe shock and retard recovery, leaving the railroads no better, and perhaps worse, off than they were before. Apparently this has been the view of the carriers, for they have not undertaken to initiate increases in rates nor have they asked us to exercise our authority in this direction.

In our judgment this experience sustains beyond question the conclusion that general economic conditions must be taken into consideration in the determination of the general freight rate level, and that it is impracticable to control this matter by the automatic application of service-at-cost or other like mechanical principles. But if this conclusion be accepted, does it follow that section 15a should be eliminated entirely and without substitute?

Original Purpose of 15a

In answering this question it is necessary to consider what section 15a was designed to accomplish. In its present form it was chiefly urged upon Congress by an association of railroad security owners, rather than by the railroads themselves. The purpose undoubtedly was to afford investors in such securities additional assurance that railroad earnings and credit would be adequately maintained, through the introduction in the statute of definitie instructions to the commission covering this matter, and in this way to encourage the inflow of capital required to meet the transportation needs of the country. Previously there had been no such instructions and, rightly or wrongly, the impression had been created among investors that the commission could not safely be intrusted with such discretion and that some definite statutory measure of protection was needed.

Importance of Adequate Credit Recognized

It is of utmost importance to the public that the carriers should have adequate credit, in order that they may finance the additions and improvements which are continually needed if good service is to be maintained. The commission recognizes this fact, and we have no doubt that it will continue to recognize it and be influenced accordingly in its action, whether or not any specific direction to that effect may be contained in the statutes. However, it is sound practice for Congress to lay down specifically the general standards which it wishes its agencies to follow in the administration of the law, where those standards are capable of concrete and reasonably concise statement.

As aforesaid, experience justifies the conclusion that the rule now laid down in section 15a, although sound in principle, is in certain respects impracticable. One principal objection to it is that it employs as a rate base a "value" the nature of which has never been clearly defined but which apparently depends upon repeated exercises of judgment after the determination and considration of various elements which continually fluctuate and to some extent are mutually inconsistent, so that it is impossible to keep the ascertainment current or to forecast accurately its future trend. Another objection, even more important, is that it undertakes to keep net railway operating income at approximately a constant level, without regard to the general industrial conditions which are so quickly and sharply reflected in railroad traffic. The first objection S. 4005 attempts to meet, but it does not attempt to meet the other.

Law Should Provide Some Guide

One way of dealing with this situation would be to eliminate section 15a entirely and substitute a simple injunction that in regulating the general rate level the commission shall be guided by the need for maintaining, under conditions of efficient and economical management, adequate credit for the railroads. This way merits serious consideration, but if any more definite method is practicable, obviously it would have advantages. Upon consideration it seems to us desirable that the law should provide some sort of a barometer of earnings by which the commission may be guided in its action, but that the commission should have more leeway in following this guide, and in giving weight to general economic considerations, than is now contemplated by section 15a.

If the recapture provisions are eliminated, as we recommend, the greater part of the remainder of the bill can be stricken, although section 2 should be retained and some provision should be made for the disposition of the recaptured funds which have already been paid to the commission. Section 3 would repeal paragraph (f) of section 19a, which provides that the basic valuations be brought up to date "in like manner" from time to time. In our report to you on S. 4005 dated May 17, 1930, we favored such repeal. Upon further consideration, however, we believe that paragraph (f) should be amended rather than repealed. While it is true that the rate bases provided for by S. 4005 will be brought up to date for current use each year by accounting methods, i.e., chiefly by the addition

of net additions and betterments as disclosed by the accounts, our experience has shown that it is very desirable in the public interest to check the amounts so shown in the accounts through field investigations by engineers. The need for this can be demonstrated in detail, if that is desired by your committee. Furthermore, it is also very desirable that an effective working force be maintained in our Bureau of Valuation, until it becomes reasonably clear that it will not be necessary for the commission, because of decisions of the Supreme Court or otherwise, to make or check actual valuations of railroad properties.

There are, however, certain major criticisms of the plan in S. 4005 for substituting a rate base for "fair value" which we desire to discuss in this report, because we believe that they are founded upon a basic misconception. The thought runs through practically all of the communications that this is an attempt to perform by legislation what is in fact a judicial function. The representative of the National Industrial Traffic League, for example, states that it is the "opinion of eminent counsel that Congress cannot by legislative fiat arbitrarily define value," and that the "adjudication of value is an abstract resultant of informed judgment."

The general counsel of the Association of Railway Executives also states that the "ascertainment of value is a judicial process, and the weight to be given to the elements necessary to be considered, is a judicial and not a legislative question." Attention, however, may be called at this point to the fact that a close reading of his communication indicates that there is a distinction in his mind between the use of such a rate base as is provided in S. 4005 in determining the general level of rates and its use for purposes of recapture.

Rate-Fixing a Legislative Function

The determination of "value," in the sense in which that word is ordinarily used by economists, is undoubtedly a judicial process, and it was such a value which was under consideration in the *Monongahela case,* which arose out of condemnation proceedings. On the other hand, the fixing of rates for the future is undoubtedly a legislative function, and so far as this commission is concerned Congress is the fountainhead of our power and we act only by virtue of its authority.

As we stated in our report to you of January 20, 1930, on S. J. Resolution 104, this power of rate regulation which Congress possesses is a power without limit, save as limitation is found in those provisions of the Constitution which protect private property from Confiscation, i.e., from a taking for public use without just compensation, or without due process of law. The "fair value" rule first enunciated by the Supreme Court in *Smyth* v. *Ames* is merely its judicial interpretation of this constitutional limitation. Plainly Congress cannot by any process of legislation escape from this limitation, and in our prior reports upon S. J. Resolution 104 and S. 4005 we had this fact always in mind. It is our opinion, however, that what is proposed in the rate base plan of S. 4005, especially if it is modified by the amendments which we have suggested, will not be found by the Court to transgress the Constitution limitation, when the purpose and intent of that proposal and the results which it seeks to achieve are understood and given thorough consideration.

In the first place, the "fair value" of *Smyth* v. *Ames* and subsequent decisions is plainly not value in the sense in which economists ordinarily use the word. But if "fair value" is not value as economists ordinarily use the term, what precisely is it? We submit that this question has not as yet been clearly answered by the Court. The oft-repeated rule in *Smyth* v. *Ames* specifies certain elements which, among others, are "matters for consideration" in determining "fair value," and which are to be given "such weight as may be just and right in each case." But before judgment can be exercised in determining the weight to be given such elements in any individual case, there must necessarily be some clear conception of just what it is that is to be ascertained. There have been attempts to arrive at such a conception by process of deduction from various of the Court's valuation decisions, but these attempts have arrived at conflicting results, and we submit that the matter is still in doubt.

Result Depends on Both Percentage and Base

Moreover, as we pointed out in our report of June 20 on S. J. Resolution 104, "fair value" is only one factor in the judicial interpretation of the constitutional prohibition against confiscation. The other factor, quite as important, is the "fair return" upon this value. It is only by combined consideration of both of these factors that the end at which the Court is aiming can definitely be located. Approached from this point of view, a better understanding of the valuation decisions of the Court can, we believe, be had.

It appears clear that at least one important end which the Court has in mind, as the product of fair value and fair return combined, is financial soundness for the utility and the maintenance of earnings adequate, under efficient and economical management, to maintain and support the credit necessary for the proper discharge of the public duties of the utility. It will be noted that this is the very thought which is uppermost in the amendment to S. 4005 which we submit herewith as Appendix A.

This end is of the very essence in the interpretation of the Constitutional prohibition, for it is difficult to see how confiscation can result if such an end is achieved. And if this be correct, a method of regulating rates which seeks to attain that end is constitutional.

Rate-Making a Practical Problem

The regulation of railroad rates, as some of the communications on S. 4005 which have been submitted to you point out, is an intensely practical problem involving much more than legal theories. It is appropriate that in the exercise of its legislative power Congress should indicate as clearly as possible the standards which it wishes to govern in fixing the general level of these rates. This involves no invasion of the judicial function, for within its sphere the Court will of course continue to be supreme. If Congress through misunderstanding trespasses beyond the bounds of Constitutional limitations, the Court will interpose. But we believe that in the consideration of the highly practical problem presented by the regulation of railroad rates, the Court will welcome an explicit expression of the views of the Congress, because it has never had the benefit of those views and because, also, what is "just and right" in dealing with this problem is no legalistic matter but most assuredly a broad question of sound public policy.

We rest our view, therefore, that the Court will not declare unconstitutional the rate base plan proposed in S. 4005, as modified by the amendments which we have suggested, upon the following basic considerations:

1. It is a plan capable of effective administration, and established upon a base characterized by stability, reliability, and relative ease of adjustment to property changes. In these respects it differs radically from the "fair value" plan now contained in section 15a. At the same time the rate base, as defined in the bill, is not inconsistent, we believe, with the idea underlying the "fair value" of *Smyth* v. *Ames.*

2. It seeks to achieve the end which the Supreme Court has indicated as the resultant to be obtained from fair value and fair return combined, namely, financial soundness for the railroads and the maintenance and support of a credit which will enable them to secure the capital required for the proper discharge of their public duties.

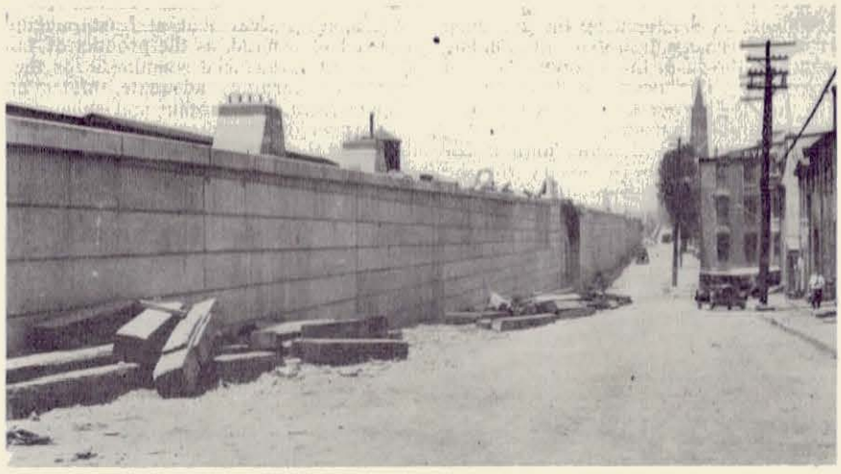
We venture to express the further opinion, in conclusion, that if the recapture provisions are eliminated, it is more than doubtful whether the carriers will ever find it necessary or advisable to bring the constitutionality of such legislation to the Supreme Court for determination.

Differing Views of Some Commissioners

Commissioners Farrell, Lee and Tate concur in the views herein expressed, but think that, in reviewing our rate and valuation orders, the courts will determine whether action taken by us enables carriers to earn a fair return upon the reasonable value of the property used by them in performing common carrier services for the public, and are therefore of opinion that any rules prescribed by the Congress for our guidance should be so worded that their proper application will accomplish that result.

Chairman Brainerd is of the opinion that the determination of whether rates prescribed for the transportation of persons or property afford just compensation is a judicial function, in the determination of which there is necessarily involved a consideration, among other matters, of the present value of the property used in the service of transportation, to be ascertained in the manner prescribed by the Supreme Court. The question whether rates prescribed under a plan which does not require a fixing of the present fair value of the property used afford an adequate return depends upon the effect of the rates imposed; that it is the result and not the method used that is of constitutional importance. Whether the plan recommended is in harmony with the Constitution depends, as he views the matter, upon the results which may follow from the use of the plan, ultimately to be determined by applying the tests prescribed by the Court.

Separate expressions by Commissioner Lewis, who concurred in the letter, by Commissioner Porter, who concurs in part, and by Commissioner Eastman were appended.



At the South End of the Work Looking North Along Cresson Street and the High Concrete Retaining Wall Separating the Street from the Newly Elevated Track Level

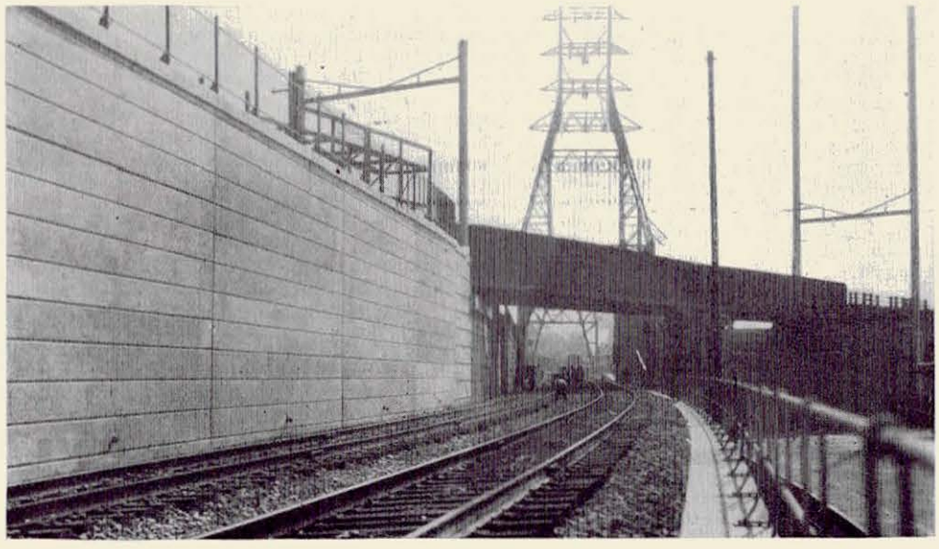
Reading Completes Grade Separation Work at Manayunk, Pa.

Surmounts unusual construction difficulties in elevating its tracks for 1 1-3 miles through suburb of Philadelphia

ONE of the most outstanding track elevation and grade crossing elimination projects completed during the last year was carried out on the Philadelphia, Germantown and Norristown line of the Reading, through Manayunk, Pa., within the limits of Philadelphia, in the continuation of an extensive grade crossing elimination program, which, within a few years, will bring about the elimination of all grade crossings on this line within the city limits. The Manayunk work, which was completed last September, and which cost in the neighhood of $3,500,000, extends over a distance of 7,200 ft. and involved not only the elimination of a number of important grade crossings, but also the removal of the Reading's tracks from an important city street for a distance of 1,650 ft. In overcoming these conditions, the Reading elevated its tracks principally by means of high fills confined within a narrow right-of-way by retaining walls, and by the construction of a considerable section of steel viaduct. The Manayunk work is of interest not alone because of its magnitude, but also because of the many difficulties encountered and the unusual methods which were adopted in order to carry on construction and normal train operation simultaneously without interference with each other.

Reading Has Eliminated Many Grade Crossings

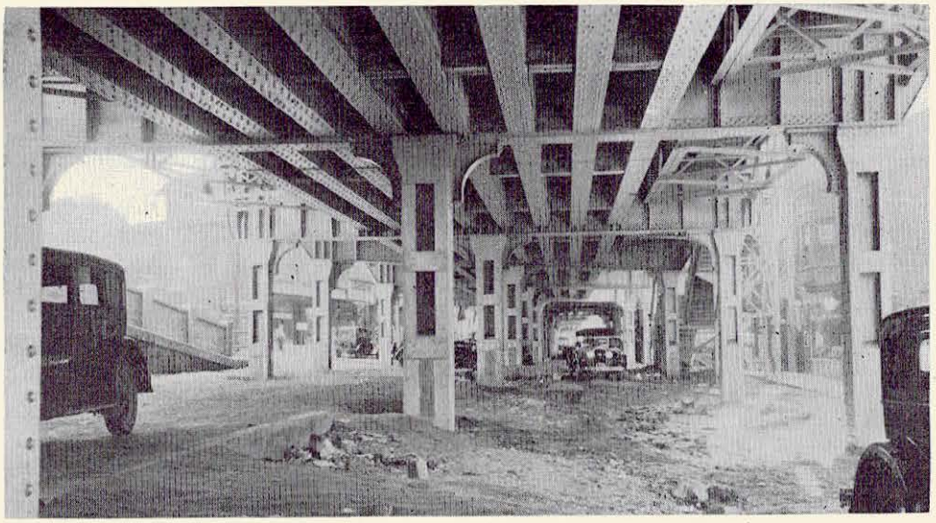
The Manayunk work is an extension of previous large grade crossing elimination projects on the Philadelphia, Germantown and Norristown line, the largest unit of which was carried out between 1907 and 1912. This



Looking South Over the Elevated Tracks Under the New Approach Span of the Pennsylvania's Schuylkill River Bridge. New Local Freight Facilities are at the Lower Level on the Right

latter unit included the elevation of four and six tracks over a distance of about four miles on the main approach to the Reading terminal, beginning at Green street, near the terminal, and extending to a point near Wayne Junction. Within this territory 31 grade crossings were eliminated at a cost of approximately $8,000,000.

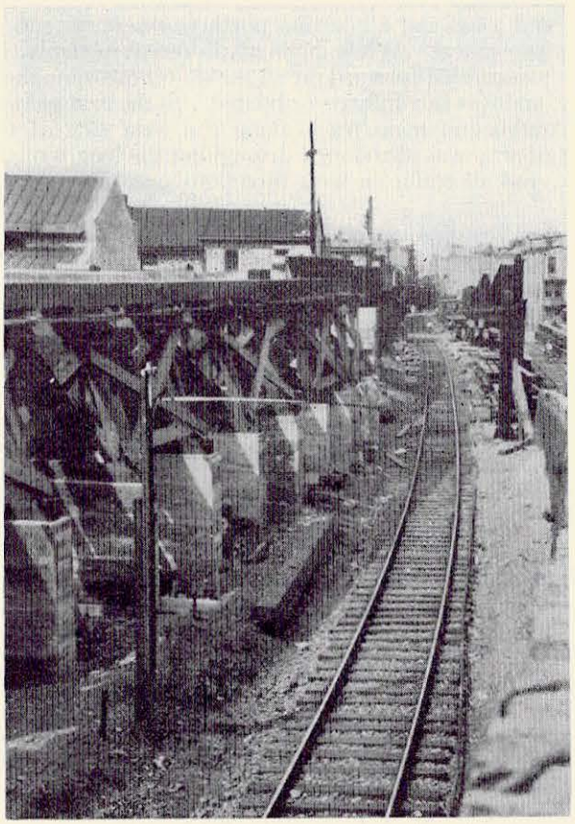
During 1927 and 1928 another important grade crossing elimination project was carried out on this line, at Wissahickon, Philadelphia, about 6.4 miles from the Reading terminal. This project, which involved an expenditure of about $1,500,000, eliminated one of the most dangerous crossings on the Reading; that of Ridge avenue, which was changed in alinement and carried over the railroad on an attractive reinforced concrete bridge. Manayunk is the next station north of Wissahickon, and with the completion of the work at this point, only six grade crossings remain on the P. G. & N. line from Manayunk into the Reading terminal, and the elimination of these is already under consideration.



Looking North Under a Section of the Completed Viaduct Through the Business Section of Manayunk

Manayunk Project Involved Heavy Work

At Manayunk, the Reading, with two main tracks, extends in a generally north and south direction directly through the business section of the town. Throughout this territory the tracks are located high up on the steep and rugged east slope of the Schuylkill River valley, and are crossed at right angles by numerous city streets, which, of necessity approach the railroad on steep grades.



Early in the Work, Through the Congested Business District, Showing the Use of Concrete Piers Necessary to Carry the High Temporary Trestle for the Southbound Main

Approaching Manayunk from the south, that is, from the center of Philadelphia, the Reading's tracks are paralleled closely for about 1½ miles on the east side by Cresson street, the grade of which rises and falls sharply with the general contour of the hillside. Throughout this territory this street did not in itself present difficulties, even though it was approximately at the track level at certain points, because it was entirely separated from the right-of-way by a five-foot reinforced concrete, solid panel fence, which the railroad constructed in 1927. However, within this territory there were four dangerous grade crossings of streets which intersected Cresson street.

At Cotton street, the first cross street at the south end of the main business district of Manayunk, Cresson street widened out to the west, and from this point north for six city blocks, the railroad tracks occupied the center of the street. Within this section, Cresson street, which was 50 ft. wide, was lined on both sides with stores and other business structures, and was crossed or intersected at grade by nine east and west streets, the most northerly of which is called Green lane. North of Green lane the railroad occupied a private right-of-way, passed under the east approach of the Pennsylvania's Schuylkill Valley division bridge over the Schuylkill river, and then extended north for a distance of about 1,900 ft. to Leverington avenue, at the north end of the town, which extended under the tracks in a narrow underpass.

In removing its tracks from Cresson street and eliminating the grade crossings at Manayunk, the Reading raised its line through a distance of about 1⅓ miles. Throughout that section of Cresson street occupied by the tracks at grade, the new tracks are carried overhead on a structural steel viaduct, largely encased in concrete, permitting the free movement of street traffic beneath.

South of this section, the tracks rise to the elevation of the viaduct on an earth embankment retained on both sides by concrete retaining walls. North of the viaduct the tracks have been moved east to a new location through a side-hill cut. Here, they pass under a new approach span of the Pennsylvania's Schuylkill River bridge, constructed by the Pennsylvania for this purpose.

This relocation of the tracks not only improved their alinement, but also made available additional area along their west side for a new local freight yard which has been provided as an additional improvement of facilities at that point.

All Grade Crossings Eliminated

Instead of a pronounced dip in the track grade which existed formerly through the center of the town, the tracks in the completed work rise on a 0.3 per cent grade from the south end of the improvement to within about 500 ft. of the viaduct, from which point the new grade descends at a rate of from 0.62 to 0.66 per cent to a point near the overhead crossing of the Pennsylvania's river bridge, beyond which it flattens out to a connection with the old line about 2,000 ft. further north.

A reinforced concrete arch of 50-ft. span carries the tracks over Shurs lane, the first crossing at the south end of the improvement, and deck girder bridges of 50-ft. span, with column bents at the curb lines, carry the tracks over Jamestown and Pensdale streets, the next two streets to the north. At the next street to the north, called Rector street, which formerly passed over the tracks on a frame bridge with a wood floor system, the crossing has been replaced by a pedestrian subway. At Roxborough street, the next street to the north and the beginning of the steel viaduct structure over Cresson street, and at all of the other crossings under the viaduct, plate girder spans carry the tracks. This type of construction is also used in a new crossing at Leverington avenue at the extreme north end of the improvement.

The completed work at Manayunk involved approximately 52,000 cu. yd. of grading, 57,000 cu. yd. of concrete masonry, and about 5,600 tons of structural steel.

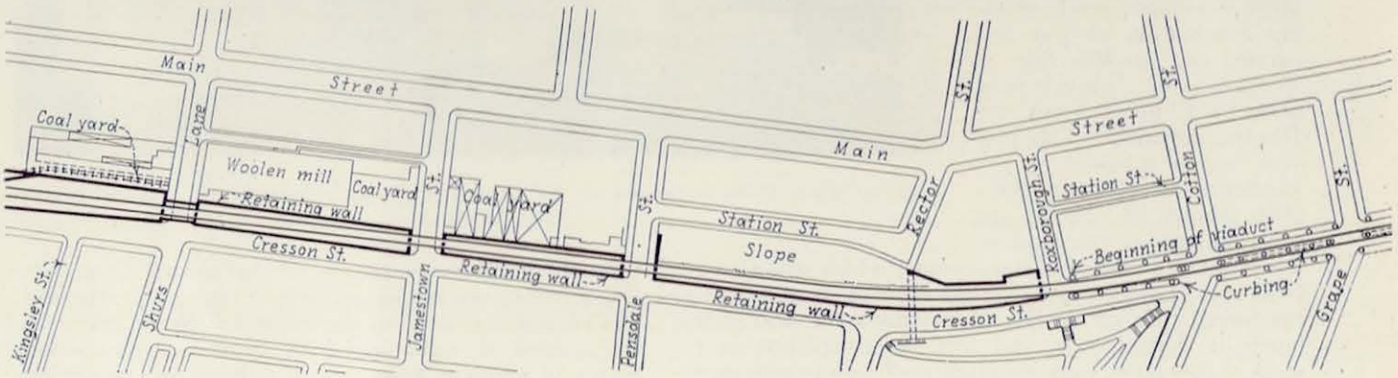
Many Engineering Problems Were Encountered

Many difficulties were involved in the elevation of the tracks through Manayunk. In the first place, the narrowness of the right-of-way at many points throughout the length of the fill section at the south end required the construction of extensive timber trestlework along one side of the right-of-way in order to permit uninterrupted train operation and to provide for the embankment. Neither half of the embankment could have been built otherwise on the confined right-of-way at these points without blocking all train operation on the other half.

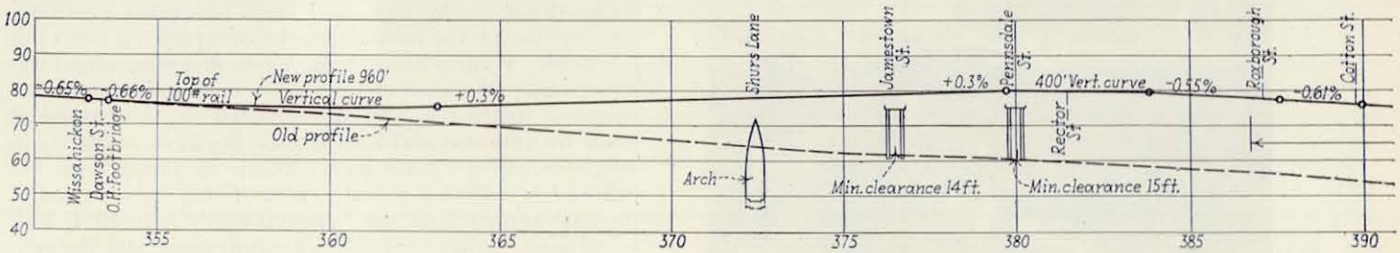
The fact that the line lay in a side-hill cut also presented additional problems and made it necessary to construct unusually high and massive retaining walls, especially on the downhill side of the right-of-way. Of no small concern too was the fact that the rock formation under the right-of-way was irregular and faulted and at places fell off from 15 ft. to 30 ft. within an equal horizontal distance.

The work at Manayunk was divided into three main sections; the fill section at the south end, extending north to Roxborough street, the viaduct section north to Green lane, and a cut and fill section north to the north end of the improvement. While distinctly different in character, work was carried forward on all three sections simultaneously, and was carefully co-ordinated. In the first section, the southbound main track along the west side of the right-of-way was abandoned throughout the length of the work, and all traffic in both directions was carried over the existing northbound main on the east side of the right-of-way, which was equipped with temporary signal towers at both ends. With the west side of the right-of-way thus cleared, work proceeded with the construction of the concrete retaining walls along that side, and also with the construction of the west halves of the abutments and the bridges over Shurs lane, and Jamestown and Pensdale streets. As this work progressed, the timber trestle to carry the new elevated southbound track was constructed just inside the retaining wall along the west side, and joined up with the west halves of the new street bridges.

Owing to the narrowness of the right-of-way it was necessary to construct the retaining wall, almost throughout its length, with its vertical face on or toward the



General Plan of the Track Elevation



Profile of the New

right-of-way line, in order to provide sufficient width for a two-track elevated roadway and, at the same time, to keep from encroaching on adjoining property. At the higher sections of the wall, and at certain other points where it was necessary to carry the foundation of the wall from 10 ft. to 20 ft. below grade, this method of construction brought the heel of the wall within a few feet of the operating track. Where this occurred, careful shoring up of the earth supporting the track was necessary while the wall footing was being constructed.

The necessity of extending the battered face of the west side retaining wall inward on the right-of-way also precluded the possibility of using pile bents in the construction of the temporary trestle along the inside of the wall, and with deep excavation necessary later for the construction of the retaining wall along the east side of the right-of-way, it was not even possible to construct the temporary trestle on mud sills at the ground level, because of the fear that the ground supporting the trestle might settle. Furthermore, where the trestle exceeded a certain height it could not be supported directly on the ground because the inside batter posts of the high bents would have encroached on the clearance of the operating track.

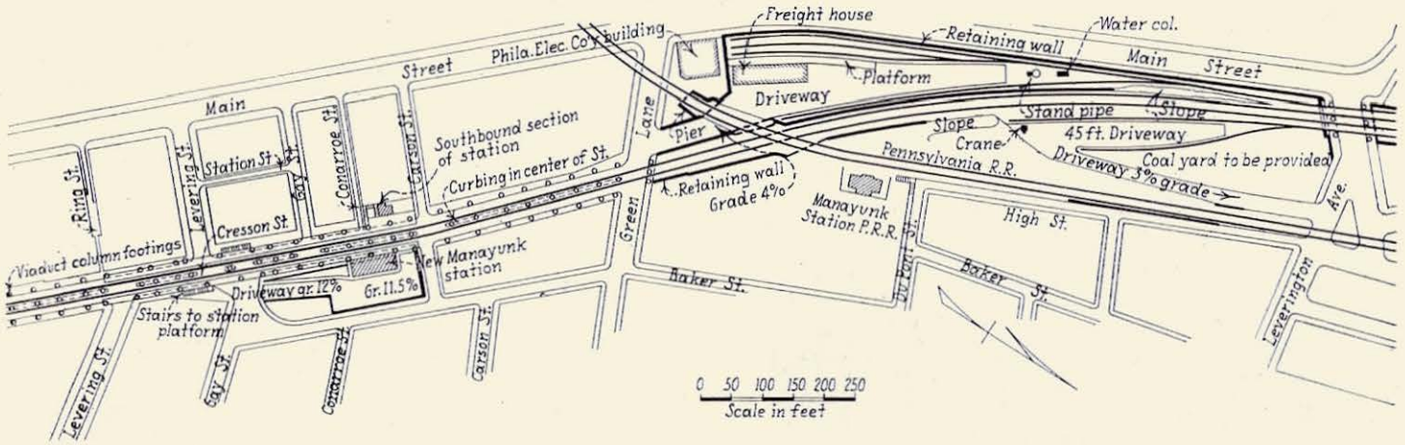
In overcoming these difficulties, concrete piers, in some cases integral with the retaining wall, were extended out at right angles from the battered face of the wall to carry the trestle bents. All of these piers were carried down to the base, or near the base of the retaining wall proper, and extended upward to at least the surface of the ground. As the height of trestle required increased with the rising grade of the line, the concrete piers were carried higher, the highest piers being about five feet above the ground level in the section of trestle between Rector and Roxborough streets. With this type of construction the trestle was given a solid bearing throughout, and there was no possibility of undermining it in making the deep excavation for the retaining wall foundation along the east side of the right-of-way.

Single-Track, High-Level Operation First

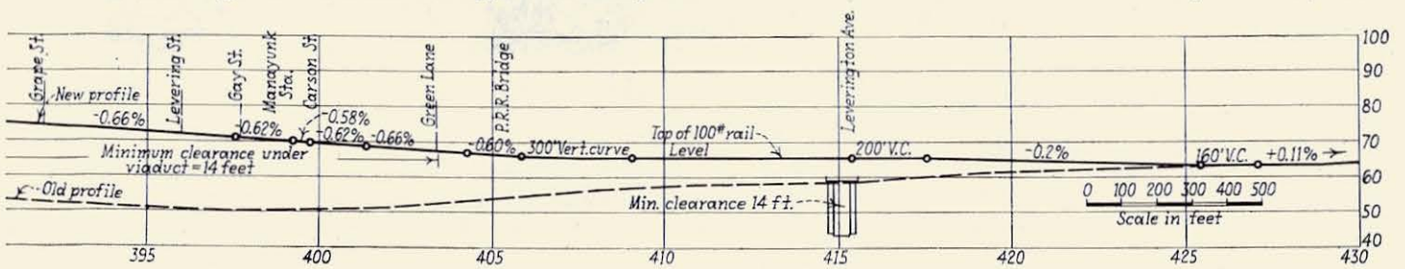
Upon the completion of the masonry and trestle work along the west side of the right-of-way, and the work north of Roxborough street, which will be described later, all traffic in both directions was shifted to the new elevated southbound track, except the portion from Roxborough street to Green lane. This left the east side of the right-of-way, north to Roxborough street, free from traffic and made it possible to proceed with the elevation of the northbound track.

From Roxborough street, where the Reading's tracks first entered upon Cresson street, north to Green lane, about 1,650 ft., the main problem encountered was to carry forward the construction of the overhead viaduct without interfering with rail traffic. The first step in the work in this section, which was started simultaneously with that at the south end of the improvement, was to abandon the southbound main, transferring all traffic to the northbound main, and then to construct all of the viaduct column footings along the west curb line. When this was done, the completed footings were covered with earth and the southbound main was re-established approximately 10 ft. west of its old location, within 13.5 ft. of the west building line, partly over the new footings, and was connected up with the live northbound track south of Roxborough street, at Roxborough street. Traffic was then diverted to the southbound track and the northbound track was taken out of service from Roxborough street to Green lane. This permitted the construction of all of the viaduct column footings in the center and along the east side of Cresson street.

Upon the completion of all of the footings at the south

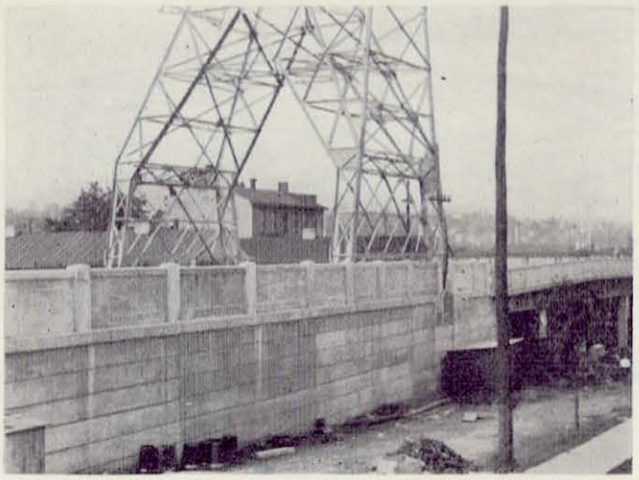


Work Through Manayunk



and Old Grades

end, the first section of the viaduct between Roxborough and Cotton streets was erected over traffic, together with the girder bridges spanning those two streets, and work then proceeded on the construction of the east half of the viaduct to Green lane. When this part of the viaduct was completed, along with the grading at the north end of the project, and the trestle and bridge work south of Roxborough street, already described, traffic through this section was transferred to the viaduct and the west half of the viaduct was then constructed.



At Roxborough Street, Showing Two Types of Construction Used; Retained Fills and a Structural Steel Viaduct, Partly Encased in Concrete. Towers for High Tension Lines Have Been Erected Over the New Elevated Roadway

In elevating the northbound main north to Roxborough street, the first steps taken were the construction of the sections of retaining wall necessary and the completion of the east halves of the three street bridges. While this work was under way, filling operations proceeded, mostly with motor trucks, between the retaining walls on the opposite sides of the right-of-way. A part of the fill was made with material removed in excavating for the footings for the retaining wall along the east side. This work was done with cranes equipped with buckets which dumped the material excavated directly into the fill around the trestle along the west side. When the embankment was completed, the ties, guard rails and stringers used in the trestle construction, all of which were of untreated long-leaf yellow pine, were removed for further use elsewhere, but all of the caps, sills, posts and bracing, which were of short-leaf pine, were left buried in the fill.

Heavy Grading at North End of Project

While the work described was under way, other extensive work was being done on the most northerly section of the project, extending north from Green lane. Within this section all traffic was first carried on the old northbound main, while a new local freight yard was being graded, and while an additional approach span was being added to the Pennsylvania's Schuylkill River bridge over the new alinement planned for the Reading's tracks north of Green lane. At this same time the west half of the new raised four-track bridge over Lexington avenue was constructed.

With the completion of the additional span of the Pennsylvania's bridge, grading for the new roadway under this span was undertaken. As the new location is in a side-hill cut, considerably above the level of the old main tracks and the new freight yard, it was necessary to construct a high retaining wall for about 350 ft. along this side of the new alinement in order to retain the steep face of the hillside between the high and low-level tracks. A similar wall, but of somewhat shorter length, was also necessary on the steep uphill side of the cut, extending each side of the new abutment of the Pennsylvania's bridge. When this work was completed, the two high-level tracks of the new line were laid. When the first of the high-level tracks south of Green lane was put in operation, one of the tracks north of this point was connected into it, forming a through track at the new high level.

Following the procedure outlined, single-track operation was necessary through Manayunk almost until the last of the work was completed. However, every detail of the work was planned so carefully that there was no interference whatever with train operation on the one through track that was kept open at all times.

Retaining Walls and Viaduct

Retaining walls were one of the largest items of construction in this work. Altogether there are about 2,350 ft. of such walls, ranging from a few feet to 30 ft. in height above the ground. In some of the higher sections

Backfilling the East Half of the Arch Over Shurs Lane. Southbound Main Already in Service

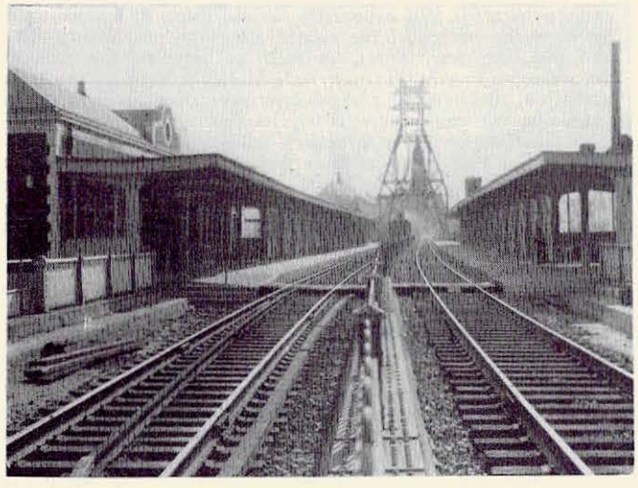
of the walls, the width of the base at the foundation is as much as 20 ft. All of the walls are of concrete with a gravity section. However, the character of the base at different points depends largely upon the character of the rock formation which was encountered. At many places it is stepped and anchored securely into the rock.

The walls were constructed with a 1-3-6 mix concrete, using wooden forms. This same mix was also used in footings and abutments, but a 1-2-4 mix was used in copings and bridge seats and at other sections directly in contact with steel. All of the aggregates used were proportioned in a Blaw-Knox batcher and hauled to the mixer at the site of the work in multiple-batch auto trucks. The water-cement ratio was not adhered to strictly, but the quantity of water used was kept to a minimum consistent with the workability desired in the concrete. In most instances the concrete was handled into the forms in drop-bottom concrete buckets, hoisted by tractor-type cranes. Each successsive pour in the walls consisted of a section 30 ft. long by 21 in. deep. Vertical key expansion joints were provided between the ends of abutting sections of the wall, and horizontal scores were

made on the exposed faces of the walls at the junctions of successive pours. At many points the retaining wall sections were backed with dry-stone packing, placed by hand, to provide drainage and to preclude any possibility of leakage through them to adjacent private property.

The viaduct, which extends longitudinally over Cresson street, is a two-track steel structure, and from Cotton street to Green lane is supported on three lines of columns, just inside of the curb lines and in the center of the street. The first section of the viaduct, between Roxborough and Cotton streets, is a two-column structure, with one line of columns near the west curb and the other near the center of the street. This type of structure was provided here because of the curving of the track alinement on to Cresson street, and because of the lesser interferences which it will cause to street traffic.

In the two-column structure, opposite lines of columns are spaced 32 ft. center to center, and the column bents are 40 ft. apart. Each row of columns supports a line of longitudinal steel girders, which, in turn, carry transverse floor beams. In the three-column structure, the lines of columns are spaced 22 ft. apart, and except for variations at street intersections the span between column bents is 40 ft. In this type of structure, between Cotton and Carson streets, four blocks, the columns support transverse girders fabricated in two units that are joined over the center columns. The bents thus formed



At the New Track Level, Looking South Over the New Station Facilities Provided

support ten lines of longitudinal girders which frame into the cross girders.

Between Carson street and Green lane, one block, the viaduct structure varies again in construction, and each row of columns carries a line of heavy through girders, which, in turn, support a system of relatively shallow floor beams. This type of construction was adopted between Carson street and Green lane in order to make possible a minimum clearance of 14 ft. over Cresson street.

Throughout the length of the viaduct, the steel floor system is encased in concrete, forming a solid deck, and the top of the concrete slab is waterproofed. All columns are filled out with concrete to a solid square section to a point five feet above street level to insure cleanliness.

In addition to the extensive work described, the Reading has constructed new local freight facilities at Manayunk, and a new modern passenger station. The new freight facilities, which replace old facilities west of the old main line tracks near Leverington avenue, occupy a triangular piece of filled-in land just north of the Pennsylvania's overhead bridge near Green lane, and west of the newly elevated main line tracks. To occupy this particular piece of land and to provide the track arrangement desired, required extensive filling operations and the construction of a concrete retaining wall along the west side of the property, which faces directly on a main street. This wall is approximately 2,100 ft. in length and has a maximum height of 30 ft. above the ground.

The freight facilities consist of a one-story, steel-frame, brick freight house, 115 ft. by 30 ft., three house tracks, a carload delivery track and a long yard lead track. The entire yard area is provided with concrete pavement with a wide ramp driveway leading to Green lane.

The new passenger station replaces an old station, in the same location, but at the new track elevation on the east side of the tracks between Gay and Carson streets. The building proper is one story high and of brick construction, and fronts on Baker street, the first parallel street east of Cresson street. The rear of the station faces directly on a long covered platform beside the northbound main track.

The station proper serves northbound trains only, and it is, therefore, supplemented by a separate and smaller unit on the opposite side of the tracks, serving southbound trains. This smaller unit, which contains a small ticket office and a small waiting room at the track level, is of the same type of construction as the main station, and likewise, is served by a long covered track platform. Both stations have stairways to Cresson street.

The lower part of this smaller unit was constructed early in the work and was put in service as a temporary station when the dismantling of the old station commenced. This method of providing temporary facilities proved effective and economical, and the partly built southbound unit of the new station was continued, therefore, as the only station facilities at Manayunk until the main station was completed and put in service. At that time, the main station was made to house all of the passenger facilities until the small southbound unit and the viaduct for the southbound track were completed.

All of the work at Manayunk was planned and carried out under the general direction of Clark Dillenbeck, chief engineer, and under the direct supervision of Charles H. Hitchcock, designing engineer. All of the grading and masonry work was done under contract by Jafolla & Marks, Inc., Philadelphia, and all the steelwork was fabricated and erected by the Phoenix Steel Company, Phoenixville, Pa. The freight and passenger stations were built by the O'Neil Construction Company, Philadelphia, while all of the track work was handled by the track force of the Reading.

* * *

The Chicago, Burlington & Quincy's Rock River Bridge Near Oregon, Ill.

Mexican National Plan Supported by Government

AN important step in the working out of the problems of the National Railways of Mexico was taken shortly after January 1 when P. Ortiz Rubio, President of Mexico, announced at Mexico City that the government had decided to support the reorganization of those lines, involving approval in practically every particular of the plan evolved by Gen. Plutarco Elías Calles and the reorganization committee of which he is chairman. At the same time full details of the plan were made public at Mexico City. Portions of the reorganization plan have been reported in the *Railway Age* during the past six months as they have been placed in effect.

While the plan has the complete backing of the Mexican government, some of its details, particularly those relating to the reorganization of the personnel, and involving the reduction of forces, are opposed by the railway labor unions of that country. The recommendations of the portion of the plan relating to railway employees are in substance as follows:

Promote the personnel of the National Railways on a basis of competition, taking into account ability and industry, to be judged by the management. Redraft on a just and equitable basis for both the unions and the company, the labor contracts, and especially the contract signed with the Alliance of Mexican Railway Workers. Allow the company to employ only that personnel which the management considers necessary for carrying on its activities. Reduce the large number of unnecessary employees now in the service. The company should be at liberty to select its personnel wherever it can obtain it to carry on its activities efficiently. The company should be at liberty to regulate its activities without the intervention of its employees, discussing with them only the conditions accepted for the performance of their duties.

Maintain a high disciplinary and efficiency level for all employees in the service of the company. Abolish the allowance of two weeks pay in lieu of a vacation period. It is desirable that everyone should have a vacation, and the employees of the National Railways should be required to take theirs. Abolish double pay for extra time worked, and for work not performed, as in the case of false kilometerage. Reorganize the method of payment of pensions and indemnities for accidents to keep those disbursements within the possibilities of the company.

At the inception of the reorganization plan, the Mexican government agreed to establish a joint committee, composed of representatives of the unions, the railway company and the government, to study the program. Later it was found that this method would retard and complicate the making of decision, if parties unqualified to take part in the discussions were allowed to intervene. With this in mind and with a desire to bring relief to the railways promptly, the government abandoned the idea of a joint committee, preferring that the unions present their points of view through the medium of the Mexican Department of Labor. While this method of procedure has not been satisfactory to the unions, President Ortiz Rubio declares that the government has found it necessary to make the situation public and to "request the working men and the unions jointly to co-operate, even though it may be necessary to make some sacrifices to settle the matter."

The remainder of the plan, which covers practically every conceivable phase of operation of the National Railways, is in general, not in dispute with the unions. A resumé of such recommendations in the reorganization plan as have not been covered in previous issues of the *Railway Age,* follows:

The group of companies forming the National Railways should be merged into one company organized under Mexican laws. The number of members composing the board of directors in Mexico City should be reduced, with complete dissolution of the board composed of citizens of the United States with headquarters at New York. Decentralize the administration of the company, the executive power of which has long been in the hands of a very few persons, without creating other executive departments, whose co-ordination in the general executive scheme might be difficult. Completely change the departmental system, substituting for it the divisional system, and give the local officers the necessary authority for the prompt handling of matters within their jurisdiction. Abolish the train auditors and police departments.

The personnel department should be reorganized so that it is deprived of its disciplinary functions, confining its activities to those of consultation, and maintenance of service letters and records of pensions and indemnities. The express, passenger and freight offices should be consolidated into one department of traffic to avoid the confusion of rates which now exists, and to promote co-ordination instead of competition. A comptroller's office should be established which, aside from its present functions of accounting, should embrace more ample functions of fiscalization and control of expenditures. A consulting department should be established which would be made up of the statistical office, the test department, a special studies office and an office of economic studies. The function of the latter office would be that of the study of tariffs, with a view to stimulating traffic and co-ordinating the services of the railroads with the necessities of the country and particularly the necessities of the shippers; the study of salaries, the preparation of budgets, and the economic study of the program for the extension and development of the railroad's facilities.

The functions of all the departments should be based upon well-prepared budgets and should be subjected to stringent budget control. All departments should be co-ordinated for expense control, and especially should there be co-ordination between the offices of the comptroller, the purchasing agent, and the test department, as well as between the principal departments consuming materials and fuel, such as the transportation, mechanical, and maintenance of way departments. Intensify the use of creosoted lumber and steel tie plates, to obtain benefits from practices which were initiated by the company in 1928. Recondition the creosoting plant at Acambaro, Gto., completing its equipment to obtain a better penetration and retention of the preservatives in the timber.

Acquire motor cars for transporting the maintenance of way personnel. Substitute rails having a weight of less than 80 lbs. per yd. with heavier rails in the main lines of the railroad. Reinforce all bridges so that they may be adequate to handle the heavier locomotives in use on the main lines. Extend bridges and other waterway openings to facilitate the drainage of land across the railroad's right of way, with a view of expediting the traffic during the rainy season, and reducing the maintenance necessary at times of heavy floods.

Extend locomotive runs and abolish roundhouses that such a change in operation would render unnecessary. Utilize the maximum tractive effort of locomotives to obtain full tonnage trains and where necessary establish helper service, all with a view to obtaining a reduction in unit costs of transportation. Reduce the number of trains on lines where traffic is not heavy. Establish rail motor car service for passenger traffic in well-populated sections where traffic is heavy and requires frequent service, as well as in those sparsely populated sections where the operation of steam trains is not justified. Divide the whole system into 10, instead of 20 divisions. Consolidate the various terminals in Mexico City.

Scrap the older locomotives and store those which are found to be unnecessary because of the greater utilization of those remaining in service. Treat all boiler waters to avoid the formation of scale, fuel waste and the danger of accidents.

Incorporate, by lease or purchase, the National of Tehuantepec as a part of the National Railways System. Incorporate the Interoceanic Railway as a part of the National Railways, or abandon it, because of the extremely unsatisfactory conditions under which it is now operated. Lease, with the option of purchasing the Ferrocarril Carbonifero de Coahuila. Co-ordinate the rail services of the company with the services offered by other transportation agencies of Mexico.

The Mexican Government's position with respect to the National Railways is explained by President Ortiz Rubio, who points out that the financial situation of the railways has for several years been very unsatisfactory. With a critical world economic situation and bad conditions in Mexico, the position of the railways

(Continued on page 292)

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Users of Highways
for Private Gain

SHOULD PAY ADEQUATE RENTAL

By F. J. Lisman
F. J. Lisman & Co.

A specific plan for assessing heavy vehicles on mileage basis for added road construction and maintenance costs they make necessary—Strict supervision of drivers' qualifications

THE public is entitled to the most efficient and economic transportation compatible with a fair return on the investment devoted to that purpose. This is axiomatic. If one method of transportation becomes less efficient, and, therefore, obsolete, the public is entitled to the more modern method and the people who have invested their money in transportation about to become obsolete should not be protected against loss any more than the owner of an obsolete residential or factory building, or of a chemical process.

Free play must be given to the various methods of transportation, whether by rail, highway, air or water. But the government should not subsidize at the expense of the taxpayers at large, one method of transportation over another.

During the last 100 years and up to recently, highways were built for the purpose of facilitating trade and living conditions in the country and to enable intercourse between country and city. With the coming of the "automobile age" our highway system has been expanded almost indefinitely for the purpose of accommodating the immense number of automobile owners who want to travel for business or pleasure.

When these highways were constructed it was not contemplated that they should or would be used by people or corporations for the purpose of deriving revenue. It never was the intent that the highways should be exploited—that is, used at the expense of the taxpayers at large—for the benefit of a comparatively few individuals or companies who are endeavoring to reap where they did not sow. The efforts to exploit the public's highways for private use are a development of the last few years and are meeting with more and more resentment on the part of the other users.

Many States, Many Experiments

Necessary restraining or regulating legislation is now being considered in many states. Such legislation is treading on new ground and therefore the basis for it must be carefully and thoroughly studied and tested. It is probably just as well that we cannot have federal legislation at this time and that the legislatures of the different states are likely to have different opinions on this subject, because quite likely we will start with a variety of different laws and find out how they work. No one, except perhaps those who have a selfish interest, will dispute the necessity of reasonable legislation which should provide for the safety of the users of the highways and that those who make their living from the use of the highways should pay their fair share of interest, maintenance, depreciation and taxes.

Obviously the problem divides itself into these two parts.

Highways Must Be Made Safer!

The railroads and, to some extent, the steamship lines have strict regulations concerning qualification of their employees who are tested as to sight, general health, color blindness, etc., and also as to experience. In order to protect the public against accidents, such employees are allowed to work only a limited number of hours and the employers are heavily fined if it is found that the employees work beyond the allotted time or have not had a sufficient period of rest. In this manner, there has been developed in the United States a most efficient organization of railroad employees consisting of experienced, high-class men who are entitled to good pay, and get it.

The danger from accidents on highways is obviously much greater than that on rails; nevertheless, the examinations for driver's license in most states are nominal and in some instances they are not required at all. The consequence is an appalling death rate amounting to about 32,500 per annum—or an average of 90 people per day—and steadily growing. The number of those who are more or less injured is several times that. Obviously the heavier the machine the more of a menace it is to other users of the road and the more care is required in selecting drivers.

Safety legislation in the interest of automobile owners at large should provide:

1. A reasonable test for driver's license for everybody.
2. The prohibition of the use of the highways by extraordinarily heavy vehicles and, say, machines more than 30 feet in length; also of excessively long, heavy or multiple trailers. Heavy machines should also be forbidden to run at unreasonable speeds.
3. The requirement that all drivers of heavy (and hence more dangerous) machines weighing more than 3 tons, before being permitted to drive such vehicles, must take an examination similar to that required by the railroads for their employees and that they should also have the necessary rest period between working hours.

Heavy Vehicles Should Pay for Added Cost They Require

Highways, including bridges, built to carry the average passenger automobile, with an average weight of under 2,500 lbs., and not to exceed 5,000 lbs., need not be constructed as strong or as expensively as highways carrying heavy trucks or buses weighing, when loaded, up to 20 tons and even more. The extra expense in con-

structing highways and bridges capable of carrying such heavy vehicles should certainly be borne as fully as possible by those who get the benefit of them—that is, those who use the highways for revenue only. Such users should also pay their pro rata of taxes, the same as the railroads do on their private right of way.

For lack of any other example, it is necessary to use the experience of railroads as a guide in this matter.

The railroads of the United States, including terminals and equipment, have a physical value of about $100,000 per mile. Excluding terminals and equipment, the average cost probably would be fully $50,000 per mile. For maintenance of their roadways, the railroads spend an average of about $2,900 per mile, from which it might be fair to deduct $900 on account of the expense of maintaining yards and terminals, leaving $2,000 per mile for keeping up the roadway .

Interest at only 5 per cent on the cost of the roadway is $2,500 and taxes per mile are about $1,600, making an average expenditure for interest, maintenance and taxes on roadway $6,100 per mile or approximately 25½ per cent of their gross earnings.

Assuming the cost of paved highways at $80,000 per mile and the average cost of a railroad at $50,000 per mile, the taxes per mile of highway should be $2,560. The upkeep varies greatly but is probably in excess of $2,500 per mile, especially when used by heavy vehicles.

The yearly interest charge on the cost of the highway at 4 per cent is $3,200 per mile, making an aggregate annual cost per mile of highway for interest, upkeep and proportionate taxes of $8,260. At least one-half of this cost should properly be borne by those who use the highway for revenue only.

Little is known as to highway vehicle-miles or ton-miles, while much is known as to railroad car-miles and railroad ton-miles but it would not be difficult (on any given section of highway, by stationing observers one or two miles apart) to find out the passenger car miles, the bus miles and truck miles. Quite likely if users of the highways for revenue only were charged a rental of 25 per cent of their gross earnings and received a rebate on their gasoline tax, the amount of revenue thus derived would, in but very few cases, be adequte to pay for the extraordinary upkeep involved by their operations.

Rental on a Mileage Basis

Probably a system of highway rentals could be worked out as to buses, on a bus seating capacity and as to trucks on the basis of hauling capacity; instead of on a percentage of gross earnings. The average revenues of buses, taking occupied and vacant seats into consideration, seems to be about 1 cent per seat mile. A thirty-passenger bus seems to gross about 30 cents per bus-mile and its reasonable proportion of maintenance of highway would probably work out in the neighborhood of 7½ cents per bus-mile.

The average revenues per truck ton-mile are probably in the neighborhood of 10 cents or, taking into consideration the fact that the truck is not loaded all the way and may return empty, it might be fair to tax trucks on the theory that the average revenues are 5 cents per ton-capacity-mile and, therefore, the fair tax would probably be 1¼ cents per ton-mile capacity or 12½ cents for a 10-ton truck. The average empty movement of railway cars is about 37 per cent. With rebate or allowance on gasoline taxes paid, highway rentals, which are not taxes but merely a fair return for the use and occupancy of valuable property, should equally apply to common carriers or to trucks owned by private concerns because in either case they are using or, possibly, abusing the highways as a place of business. The "hammer blow" of a truck or bus running at 40 miles an hour destroys a highway which, under ordinary use would be affected only by the change of the seasons.

Instruments of precision have been developed which not only count the number of miles, but actually make record on a sheet of paper of the speed of the vehicle at any given time. The Ohmer Fare Register Company, the largest manufacturer of taxicab and street car registers, produces such a machine and presumably there are others who do so. Therefore the matter of keeping official and sealed mileage records should not be difficult.

The matter of regulation of users of highways within any municipality is strictly a local question and if city councils should desire to give bus franchises without making the bus companies pay for wear and tear of the pavement, this may be their privilege, although such action would hardly seem fair, inasmuch as street railway companies in most cities are compelled to pay for the original cost and maintenance of the pavement between, and 18 inches outside of their rails although, in fact, they are the only occupants of the streets which do not wear out the pavement.

Legislation along the lines above outlined is just to all parties concerned and is certainly needful at present when the highway taxes in many sections, especially in those where farm lands have depreciated, are an excessive burden. Neither is it fair to highly trained and well paid railroad labor to be deprived of their employment by the competition of less thoroughly trained and less well paid employees.

Other Public Property Not Exploited for Profit

People have become so gradually accustomed to the use and abuse of public highways free of adequate rental charges for the purpose of private profit that they have failed to realize the injustice and absurdity of such a proposition. If it were suggested today that all or any city hospitals should be thrown open for free use of all physicians for their private charge patients, every one would promptly resent this very thought. However, the principle involved would be no different from the one now in vogue concerning the public highway; that is, the use of public highways at an inadequate charge for private profit, and the equivalent of a subsidy to some doctors to enable them to compete at an undue advantage over those who have invested capital in private sanitariums.

The Motor Vehicle Conference Committee, 366 Madison Avenue, New York, publishes a pamphlet giving the taxation, license fees, etc., etc., for motor vehicles in every state of the Union. It is interesting to note from a perusal of the table the great variety of taxes and license fees prevailing in the different states. They are so complex that they cannot be summarized or condensed. However, thus far, nowhere is a proper rental charged in proportion to usage to those who are endeavoring to enrich themselves at the cost of the taxpayers at large. Tax fees and licenses are established on the basis of weight, horse power, factory cost or value of the car, type of tires or according to fuel used, etc., and by a combination of one or more of these factors.

It is interesting to note that in New York State a passenger car weighing 5,000 lb. pays $28.75 license fee, whereas a truck weighing the same would pay only $11.25 more.

In Iowa, a truck weighing from 2½ to 3 tons, with pneumatic tires pays $100 license fees while with solid tires it pays $125. A passenger car of 5,000 lb. pays $20 license fees plus 1 per cent of its full value which is reduced to ½ per cent after the car is 4 years old.

In Illinois a truck weighing one to five thousand

pounds pays $12 license fee which is the same as a passenger car with from 25 to 30 h.p.

In California license for a passenger car of any weight is but $3 while a truck weighing up to three tons pays a fee of $8.

The railroads have developed the United States and the best system of transportation in the world; they have largely paid for and are still paying for our highways and are now further overburdened by the enormous costs of grade crossing elimination which reduces their expenses infinitesimally and their interest charges tremendously. These grade crossing eliminations greatly benefit highway users and should be paid for by them.

General Taxpayers Now Bear the Burden

Railways and all taxpayers have the right to ask that their competitors should not be subsidized by being able to use the highways for revenue only without paying adequately for their use. This subsidy aggregates many millions which should be paid by those who use the highways to make money for themselves and not by the farmers and other taxpayers!

Motor Transport Hearings in Northwest

CONTINUING its investigation under Docket 23,400, Co-ordination of Motor Transportation, the Interstate Comerce Commission held hearings at Seattle, Wash., on January 19, and at Portland, Ore., on January 22. Witnesses representing railways, motor carriers, and shippers' organizations described to Examiner Leo J. Flynn, who conducted the hearing, the present extent of motor transportation in the Pacific Northwest and steps which have been taken to co-ordinate rail and motor service.

Among the witnesses at the Seattle hearing was R. H. Culbertson, manager of the Washington Freight Association, who testified that the various truck lines belonging to the association, and holding certificates from the Washington Department of Public Works, handled 435,832 tons of freight in 1929, an increase of nearly 35,000 tons over the traffic handled in the previous year. The 120 companies affiliated with the association operate 520 trucks and 103 trailers.

At the Portland hearing, W. J. Eccles, president of the Sumpter Valley Railway, and vice-president and general manager of the Mount Hood Railroad, testified that his companies have suffered severe losses in recent years as a result of competition from private automobiles and motor truck lines. The Sumpter Valley has applied for authority to abandon 20 miles of its line on account of the loss of freight traffic to a truck line operated by three business houses in Baker, Ore. L.c.l. freight traffic moving by rail in the Hood River valley is currently 85 per cent less in volume than it it was in 1922.

R. H. Crozier, general passenger agent of the Spokane, Portland & Seattle, and of the S. P. & S. Transportation Company, its motor coach operating subsidiary, testified that the railway has been able to recover part of its lost passenger traffic through the operation of motor coach lines. Prior to the organization of the transportation company in 1924, the railway had lost 58 per cent of its passenger revenue.

R. W. Pickard, general freight agent of the S. P. & S., described the organization of the Northwest Freight Transport Company, which was established by the railway in order to provide store-door collection and delivery service. The freight transport company contracts with local trucking organizations for pick-up and delivery service in Portland and at Willamette Valley points, the intercity movement of traffic being made over the railway. The service has been in effect only two months, but it is estimated that 35 per cent of the traffic handled by the Northwest Freight Transport Company is business formerly handled directly by the railway and 65 per cent is new business.

A. F. Harvey, of the Oregon Public Service Commission, testified that in his opinion regulation of interstate trucking service would be beneficial to the public and would eliminate "cut-throat" competition. He said that there are 52 motor coach lines operating in Oregon with permits from the public service commission, these organizations having 16,909 miles of routes competitive with railways and 1,175 miles of routes non-competitive with railways. There are 171 common carrier motor truck lines with permits, competing with railways over 16,890 miles of routes and having 1,898 miles of non-competitive routes. These companies are operating 569 trucks and 147 trailers. There are 1,445 trucks and 346 trailers operated by "contract haulers" in Oregon, and 1,609 trucks and 15 trailers operated by "commercial carriers." In addition there are 616 operators of "anywhere-for-hire" trucks, employing 860 trucks and 48 trailers.

W. L. James, manager of the Consolidated Truck Lines, testified in favor of regulation of interstate truck lines. The longest operation of this company extends from Portland, Ore., to Medford, where shipments are transferred to another truck line operating between Medford and San Francisco.

Testimony in favor of regulation of interstate truck lines was also given by Charles J. Shelton, secretary-manager of the Oregon Freight Association. He said that competition has been sharpened during the last two years by the advent of numerous "wild-cat" operators, who injure established truck lines as well as the railways. This kind of competition has resulted in the establishment of low rates, and Mr. Shelton testified that in his opinion the present rates of the motor carriers are entirely too low.

Northwest Truck Services Described

W. A. Curtin, secretary-manager of the Portland Traffic and Transportation Association, described the development of truck service in the Pacific Northwest, and said that the demand for store-door collection and delivery service is increasing. The service inaugurated by the Southern Pacific through the Pacific Motor Transport Company, and by the Spokane, Portland & Seattle through the Northwest Freight Transport Company, he said, has been satisfactory to shippers. Mr. Curtin testified in part as follows:

> The entire Northwest is covered by a system of truck lines operating on fixed schedules and in competition with rail lines at practically all points that are served by rail. These truck lines operate under a store-door pick-up and delivery system and at rates which are just about the same or slightly higher than the standard rail rates without the pick-up and delivery service. There are approximately 110 truck lines operating between Portland and other points in the Pacific Northwest, and they carry freight to points as far east as Twin Falls, Ida., a distance of 630 miles. Some of them connect with each other and interchange freight at certain points for long hauls. An instance of this is found in an arrangement between the Consolidated Truck Lines and the Oregon-California Fast Freight for a connection at Medford, Ore., to handle freight under a through-rate arrangement between Portland

and San Francisco. The distance by highway is 727 miles. The competition between highway freight transportation and the rail lines is very keen, particularly in short-haul business or hauls up to 250 miles.

(Mr. Curtin here described the earlier efforts of railways to meet truck competition, particularly the tariff which went into effect last year, providing for a rate of 30 cents a hundred on many classes of freight moving between Portland and Puget Sound cities, with a minimum weight of 20,000 lb. Truck lines working with the railways are offering pick-up and delivery service in terminals and consolidating shipments for movement by rail under this tariff.)

At the present time there is rather heated competition between the truck lines and this co-ordinated truck and rail service. The truck lines' rates between Portland and Seattle are a flat 30 cents a hundred for all freight not rated higher than first class. The interstate freight lines, which are the lines operating the present truck and rail service, also charge 30 cents a hundred for all freight not rated higher than first class.

In October, 1930, the Northwest Freight Transport Company, controlled by the Spokane, Portland & Seattle, published its local Freight Tariff No. 1 naming class rates between stations on the Northwest Freight Transport Company in Oregon south of Portland. This tariff named rates between Portland and Salem, Albany, Corvallis and Eugene, for the first four classes, somewhat in excess of the all-rail rates between the same points. Charges named in the tariff apply to or from points shown, with pick-up and delivery, and include loading on or unloading from trucks within the pick-up and delivery districts of each city as defined in the tariff. At Salem, Albany, Corvallis, and Eugene, they include all points within the city limits, but at Portland pick-up and delivery limits are less extensive. Under this tariff, the Northwest Freight Transport Company acts as an assembling company and as a delivery company for the Oregon Electric, over whose rails freight between the points named in the tariff is transported. On December 15, 1930, the scope of this company's operations was considerably extended, to include Hillsboro and Forest Grove; Harrisburg and Junction City, two points between Corvallis and Eugene; and Vernonia and certain points on the line of the Spokane, Portland & Seattle between Portland and Seaside. They also changed the rates in their tariff, making lower rates than those originally named for lots of 20,000 lb. or over.

On December 8, 1930, the Pacific Motor Transport Company made its appearance. This company serves the principal points on the Southern Pacific in the territory from Canby south to Ashland, Ore. Its tariff is known as Local Express Freight Tariff No. 4, Public Service Commission of Oregon's No. 1, naming class and commodity rates and also rules and regulations covering the transportation of express between Portland and points in Oregon. The rates named are similar to those put into effect on December 15, 1930, by the Northwest Freight Transport Company, and they include pick-up and delivery service applying to points on the Southern Pacific in Oregon.

Rates Compared

Between Portland and Eugene, on December 15 of last year, we had various lines competing with each other: The rail lines operating under standard class rates without the pick-up and delivery service; privately owned and operated common carrier truck lines operating over the highways under standard class rates, with pick-up and delivery service; and two separately owned and operated railway transportation companies, operating also on class rates but under an arrangement whereby the trucks pick up the freight, which is loaded into cars at the freight houses of the railway, hauled over the railway to destination, unloaded there and delivered by truck to the consignee's door. There are two of these companies, the Northwest Freight Transport Company, owned by the Spokane, Portland & Seattle, and the Pacific Motor Transport Company, owned by the Southern Pacific. The first four class rates of these companies from Portland to Eugene are:

	1	2	3	4
Standard rail without pick-up and delivery	65	55½	45	39½
Rail with pick-up and delivery	67	57	47	40
Rail with pick-up and delivery, 20,000 lb. or more	55	45	35	30
Truck with pick-up and delivery	67	57	47	40
Truck with pick-up and delivery, 10,000 lb.	62	52	42	35
Truck with pick-up and delivery, 20,000 lb.	57	47	37	30

The Pacific Motor Transport Company, in addition to furnishing active competition between the truck lines and the rail lines between Portland and Southern Pacific stations in Oregon, has also enabled us to meet the competition of San Francisco shippers shipping into southern Oregon through Crescent City, Cal. The Hobbs Wall interests of Crescent City own a line of lumber schooners plying between San Francisco and Crescent City. These schooners are maintained principally to haul lumber to San Francisco from Crescent City. Thus their traffic is largely a one-way traffic, all southbound. In order to encourage a northbound tonnage, they have entered into a through-rate arrangement with a truck line running from Crescent City to Medford, Grants Pass and Klamath Falls. So low is the rate that it is extremely difficult for Portland merchants to do business at those points. The rates published from Portland by the Pacific Motor Transport Company have considerably relieved the situation, and as fast as new rates can be worked out by that company they are being published, so that this new service has so far relieved to a large extent and promises to further relieve a very unsatisfactory situation. This is pointed out as one of the advantages to us of this co-ordinated service. We are on the whole pleased with it.

The Portland hearing adjourned on January 22, to be continued at San Francisco, Cal., January 27.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended January 17 amounted to 725,938 cars, a decrease of 121,217 cars, or about 14 per cent, as compared with the loading in the corresponding week of last year and of 205,923 cars or 22 per cent, as compared with 1929. Loading of grain and grain products and livestock showed small increases as compared with the corresponding week of last year but all other commodity classifications and all districts reported decreases as compared with both years. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

Week Ended Saturday, January 17, 1931			
Districts	1931	1930	1929
Eastern	166,754	194,849	212,906
Allegheny	142,955	171,318	186,253
Pocahontas	45,781	57,111	58,606
Southern	110,615	135,635	142,216
Northwestern	88,625	100,631	111,219
Central Western	114,521	119,003	143,533
Southwestern	56,687	68,608	77,128
Total Western Districts	259,833	288,242	331,880
Total All Roads	725,938	847,155	931,861
Commodities			
Grain and Grain Products	41,112	37,500	48,165
Live Stock	27,317	26,838	32,226
Coal	167,193	190,882	215,074
Coke	8,942	11,194	12,906
Forest Products	32,295	46,990	58,836
Ore	4,916	8,052	8,356
Mdse. L.C.L.	206,505	232,072	239,170
Miscellaneous	237,658	293,627	317,128
January 17	725,938	847,155	931,861
January 10	714,251	862,461	914,438
January 3	615,382	775,755	798,682
December 27	.....	538,419	639,389
December 20	.....	713,810	842,775
Cumulative total, 3 weeks	2,055,571	2,485,371	2,644,981

Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended January 17 totaled 47,115 cars, an increase over the previous week of 3,149 cars but a decrease of 8,858 cars from the same week last year.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada		
January 17, 1931	47,115	27,491
January 10, 1931	43,966	24,773
January 3, 1931	36,349	21,966
January 18, 1930	55,973	35,426
Cumulative Totals for Canada		
January 17, 1931	127,430	74,230
January 18, 1930	152,392	99,284
January 19, 1929	161,399	105,783

"Unfair Competition" Hearings Draw to Close

F. W. Ellis denies packer's traffic influenced by draft gear sales—L. W. Baldwin testifies

ON January 21, the Federal Trade Commission concluded the presentation of its case against the Waugh Equipment Company and designated officers of Armour & Co., in which they were charged with unfair methods of competition growing out of the alleged use of the packer's traffic in selling draft gear to the railroads. Since that time, the hearings have been devoted to the testimony of the respondents. L. W. Baldwin, president of the Missouri Pacific, and F. W. Ellis, vice-president of Armour & Co., testified at these hearings, which continued in Chicago except for one day spent in St. Louis, Mo.

Mr. Baldwin was questioned about the purchases of the Waugh gear made by the Missouri Pacific and identified letters taken from his files. One of these was written on August 27, 1924, by T. Bragg, a stockholder in the Waugh Equipment Company, to E. F. Barnes, Jr., office assistant to Mr. Baldwin. In this letter, Mr. Bragg, whom Mr. Baldwin said he remembered as an associate of M. C. Brush, a director of the Missouri Pacific, said in part:

> Our Chicago friends who are interested in the Waugh Equipment Company have been discussing with Maxwell of the Wabash and with Stone and Kosser of the American Refrigerator Transit Company the possibility of using the draft gear on one of the lots of their refrigerator cars and have been assured that Waugh will receive an order on one of these lots..... provided the Missouri Pacific was agreeable.

Mr. Barnes identified F. W. Ellis, vice-president of Armour & Co., as the "Chicago friend" he knew at the time who was interested in the Waugh Equipment Company. Correspondence previously introduced in evidence showed that Mr. Ellis had written Mr. Baldwin several times during 1927 about draft gear.

In another letter, O. A. Garber, chief mechanical officer of the Missouri Pacific, writing, on March 2, 1929, to J. Cannon, vice-president of operation, said in part:

> In the period, 1922, up-to-date, we have purchased and applied to new cars and to existing equipment 17,662 car sets of Bradford rocker-type draft gear. During the period, there have been eight failures.
>
> In the period 1924 to date, we have purchased 3,400 car sets of Waugh draft gear; 2,800 car sets of these were of the old type Waugh spring plate gear. Since application, we have 22 failures of these gear. Six hundred car sets of the Waugh-Gould friction gear have been applied to cars within the past year and none of these have failed to date.

This and other letters were identified after Mr. Baldwin had been asked about the decline in the proportion of Bradford gear purchased on the Missouri Pacific and following his testimony that his mechanical advisers had recommended the Bradford gear strongly but that later they also recommended the Waugh gear.

Promises of Traffic

Mr. Baldwin testified that it was more or less the policy to buy from concerns that would influence traffic for the railroad. When asked by the attorney for the respondents if Mr. Ellis had, at any time, told him he would see that the Missouri Pacific secured an increased volume of Armour freight traffic in the event the road purchased draft gear or other equipment from the Waugh Equipment Company, he said he "didn't know that he had or that he hadn't but would think there was an implication to that effect." Also, when asked by the attorney for the respondents if any officers of the Waugh Equipment Company had ever discussed traffic, he said he remembered references having been made to traffic by A. J. Pizzini, president of the Waugh company, and, again, when asked if Mr. Pizzini ever said he could secure an increase in Armour traffic in the event the road purchased Waugh draft gear, he replied that "he rather indicated that if we did it could be brought about."

H. C. Kosser, president of the American Refrigerator Transit Company, was questioned at St. Louis about a letter written to W. C. Maxwell, vice-president of traffic of the Wabash, on October 20, 1928, in which he said in part:

> Talked with F. W. Ellis of Armour & Co. this week, who made a strong plea that orders for 1,000 A. R. T. cars be given by the Wabash to the Waugh Draft Gear Company, and also requested that I use my influence to get the Wabash to give them any cars they might have in sight.

This letter was supplemented with correspondence showing that it had been referred to and considered by J. E. Taussig, president of the Wabash. Mr. Kosser explained that purchases of and for A.R.T. equipment were made by the Missouri Pacific and the Wabash. He could not recall the letter nor the date, but remembered that Mr. Ellis had recommended the use of the Waugh gear.

W. G. Robertson, vice-president of W. H. Miner, Inc., called to testify in Chicago on June 22, submitted a statement showing that firm's sales of draft gear for new equipment, which amounted to 79,325 sets in 1924, 33,015 in 1925, 20,227 in 1926, 15,811 in 1927, 16,459 in 1928, 24,382 in 1929 and 8,873 sets in 1930. When first examined, he testified that lessened car building and increased competition in recent years explained the diminished sales of gear, but, on further questioning, said that reports received from sales representatives were to the effect that traffic considerations were playing an important part in the sales of draft gear. When asked what firms were so reported using traffic, he named the Waugh Equipment Company and the Union Draft Gear Company.

F. W. Ellis Examined

On June 22, F. W. Ellis, one of the respondents in the complaint, testified on behalf of the respondents as to the manner in which he acquired an interest in the Waugh Equipment Company. He stated that one-third of the common stock of the Waugh Equipment Company had been offered to Arthur Meeker, by A. J. Pizzini and Mr. Bragg, and Mr. Meeker invited him to

share in it. Mr. Ellis stated that his advice to Mr. Pizzini was to perfect the device so that it would sell itself, as far as possible, to mechanical men, but if he got to the point where the door was slammed in his face on account of favoritism to other makes of gear, he thought he could get him a fair hearing.

Armour & Co. Policy

He said the contract made by the Armour Car Lines with the Waugh Draft Gear Company for gear was made before the first conference between Mr. Pizzini and Mr. Meeker and explained that it grew out of an investigation of draft gear trouble which showed that the Waugh gear solved the problem. He said that, while Mr. Baldwin might have thought there was an implication of promises of increased traffic in his conversations about the draft gear, he had never told him that the road would get any increase for draft gear purchases nor that the road would be punished for not buying the gear, adding that he had a fixed policy against trading Armour & Co. traffic for any favors to the Waugh Equipment Company and cited an instance where he replied to a long-distance telephone inquiry by a railroad president as to what the purchase of draft gear would mean in traffic, with the answer that it would not mean a thing. Arthur Meeker, he said, had nothing to do with Armour & Co. traffic in recent years and that Armour & Co. has no interest in the Waugh Equipment Company. His attention was called by the attorney for the respondents to testimony of A. MacKenzie, vice-president of traffic of the Rock Island, that Mr. Ellis had received the information that the road had purchased 2,000 sets of gear in the fall of 1929, with the remark that he thought his people should have had more. He said that if such a remark were made it would only be a reflection of what Mr. Pizzini told him the Waugh Equipment Company could reasonably expect. He added that Mr. Pizzini was always anxious to tell him what was going on and what he expected in the way of business.

Mr. Ellis Cross-Examined

Following his testimony, Mr. Ellis was extensively cross-examined by the attorneys of the Federal Trade Commission. Questioned as to the examination he reported having made of the Waugh draft gear for the Armour Car Lines in 1924 and replying that some of the gear had been tried out and that the Chicago & North Western reported satisfaction, he was asked if it were not true that the gear had not been giving satisfaction on the Chicago & North Western and instead had been taken off the road since 1916, but did not recall. He was asked if it were not a fact that difficulty was experienced in getting the Chicago & North Western to buy the draft gear and his attention was called to the report written by the superintendent of the car department of the Chicago & North Western, on July 23, 1924, to F. H. Hammill, then general manager, which said in part:

> As you know, we have on our 14,000 automobile, box, flat and gondola cars, built in periods between 1908 and 1914, the Waugh draft gear, which has given us a great deal of concern and has caused us a considerable maintenance expense, due to its light capacity.

In another letter, dated December 5, 1924, A. J. Pizzini wrote a letter to Wait Talcott, a stockholder in the Waugh Equipment Company, in which Mr. Pizzini said:

> I have a feeling that you should see Mr. Finley tomorrow and see Mr. Johnson. Next week you could drop in and confidentially show my letter to Mr. Hammill and mention something about my eastern friends, predicting a consolidation of the C. & N. W. with another road.
>
> Talked with Mr. Ellis. He wants you to work up all data and keep in close touch with him. He says Mr. Meeker is "hot" about the 500 cars, as Mr Hughitt practically promised Mr. Meeker at least 1,000.
>
> Keep up the fight; if you actually need me, I will return.

In another letter dated December 6, 1924, General Manager O'Brien of the Waugh Equipment Company wrote to Mr. Ellis transmitting a memorandum for the attention of Marvin Hughitt, Jr., and others. This memorandum, marked "A memorandum for Mr. Meeker and Mr. Ellis," outlined the possible objections to the purchase of Waugh gear in part as follows:

> My suggestion is to point out to Mr. Hughitt that by purchasing this equipment the railroad will invest no more money than by the purchase of other gear and will gain
>
> 1. Maintenance material cost for eight years
> 2. All Waugh Equipment freight from and to Milwaukee, Rockford, etc.
> 3. The profit accruing from continued traffic of large shippers and their connections.

Mr. Ellis recalled having accompanied Mr. Meeker to the office of Mr. Hughitt but said that he had merely been asked to go along.

He was asked what he had told President Hannauer of the Boston & Maine during a Chicago visit, following which Mr. Hannauer had wired the superintendent of motive power that "it was important that Waugh gear be permitted in car specifications" and supplemented this on the same day, November 19, 1928, with a letter, stating that "it is very important to us," to which Mr. Ellis testified that he had told Mr. Hannauer that the Armour Car Lines were using Waugh draft gear with good results and expressed the thought that it would be a "good idea for him to look into it."

He was asked about letters which he wrote to L. W. Baldwin of the Missouri Pacific, particularly a letter dated August 27, 1925, and containing the memorandum of A. J. Pizzini to R. J. O'Brien, manager of the Waugh Equipment Company: "Don't let Fred (Ellis) fail us on the St. Louis trip." Mr. Ellis did not recall having talked with Mr. Baldwin as early as 1925 and testified that he never went out of his way to acquaint roads with the gear.

No Hope of Traffic Offered

He insisted that no one was received in his office nor any one interviewed out of his office who was led to hope that anything they would do for or against the Waugh Equipment Company would have anything to do with Armour & Co. traffic and reiterated that if they did think so he disabused their minds of it. Asked why he and Mr. Meeker and Mr. Scott were chosen to participate in the stock ownership of the Waugh Equipment Company, he replied that Mr. Meeker was well known and was the man selected to receive the stock, which he said was worthless, whereupon his attention was called to the testimony of Mr. Bragg that both he and Meeker were first mentioned in the stock proposition, to which he replied that Mr. Meeker wanted to let him in on it. He was asked if it did not occur to him that the fact that he was traffic head of Armour & Co. might have any influence with railway men in any request he might make with reference to draft gear, and replied yes, adding: "I ought to have some influence."

Asked if he had not ever exercised that influence to have roads apply and purchase the Waugh gear, in addition to having an investigation made, he replied in the negative and was questioned about the purchase of gear on the New Haven road about which several letters had been introduced in evidence, among them a letter dated

(Continued on page 298)

Action of Freight-Car Trucks*

Some results of a research relating to the operating and maintenance problems of four-wheel trucks

By T. H. Symington

President, T. H. Symington & Son, Inc., Baltimore, Md.

THE vital parts of freight cars are the trucks. We are using today the same fundamental principles in freight-car-truck design that have been in use for 75 years.

Modern heavy cars, some of great rigidity, operating at high speeds, have brought with them many operating and maintenance problems. A scientific study of these problems and means for their solution are discussed in this paper.

There being no equipment in existence with which to make a proper study of the various problems involved, it was necessary to build two standard freight cars and equip them with much special apparatus which would give exact results. Each car is also equipped with 12 water tanks to provide any desired load. The two cars were necessary in order continually to have a yardstick with which to compare the performance of different appliances.

An accurate superimposed record is made on a recording table in one of the cars of the following actions on each car:

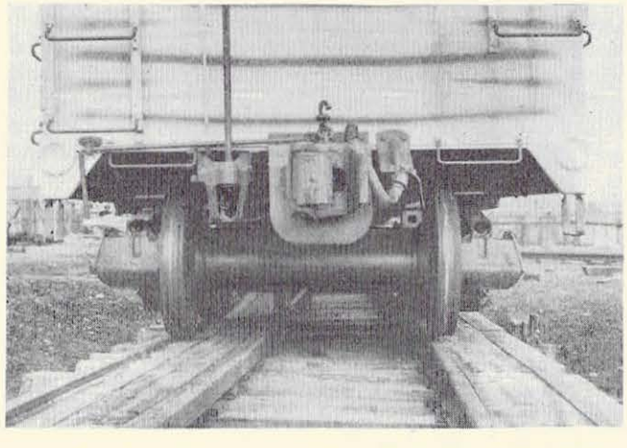
1—Speed in miles per hour.
2—All car-body roll in relation to the constant plane of Sperry gyroscopes.
3—All truck-spring movements on both sides of the leading trucks.
4—All vertical movements of the center line of each car.
5—All lateral movements between the car body and one side frame.
6—All movements, at right angles to the journals, between the journal-box wedge and the roof of the journal box.

A telemeter record is made of the magnitude and frequency of all transverse forces and of the forces of vertical acceleration resulting from spring oscillation or end shock.

Each car is also equipped with an accurate spring dynamometer with which to measure the force of vertical acceleration resulting from end shock and a Kreuger-cell instrument with which to measure both the force of vertical acceleration resulting from end shock and the same maximum force of vertical acceleration resulting from spring oscillation. Both cars are equipped with large periscopes through which to see and study all truck actions from inside the cars.

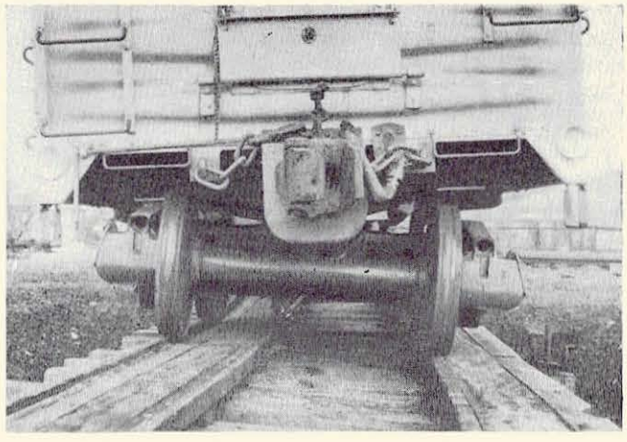
This research work naturally divides itself into four general headings, viz: Safety, Damage to Lading, Train Resistance, and Maintenance Costs. These are all so interrelated that it is thought best to discuss the truck as a whole and then in detail.

* An abstract of a paper entitled "Research Relating to the Action of Four-Wheel Freight-Car Trucks," which was presented before the Railroad Division, A. S. M. E., Tuesday afternoon, December 2, 1930.



A.R.A. Standard Bolster on 55-Ton Rigid Car, With 18-Ton Load—Roller-Side Bearings Have 1/8-in. Clearance—A.R.A. Truck Springs

The outside rail on this 10-deg. curve is depressed to produce a track warp of 2 3/16 in. between truck centers when about 15 per cent of the normal load is on the outside leading-truck wheel.



T. H. Symington Bolster, 55-Ton Rigid Car, With an 18-Ton Load—A.R.A. Truck Springs

The outside rail on this 10-deg. curve is depressed to produce a track warp of 6 in. between truck centers when about 30 per cent of normal load is on the outside leading-truck wheel.

The Four-Wheel Truck

Wheel sliding can be prevented only by having both axles always radial to the curve. This has never been accomplished in a simple, efficient four-wheel truck design. The only truck yet produced where the axles are always radial to the curve is the Boyden six-wheel freight-car truck.*

This wheel sliding always necessitates, on any curve, a continuous high flange pressure against the rail of the outside leading wheel. No derailment on curves will result from this particular flange pressure unless the weight on this wheel is unduly reduced.

Derailments

A derailing condition results from warp in the track between truck centers and not from the warp between

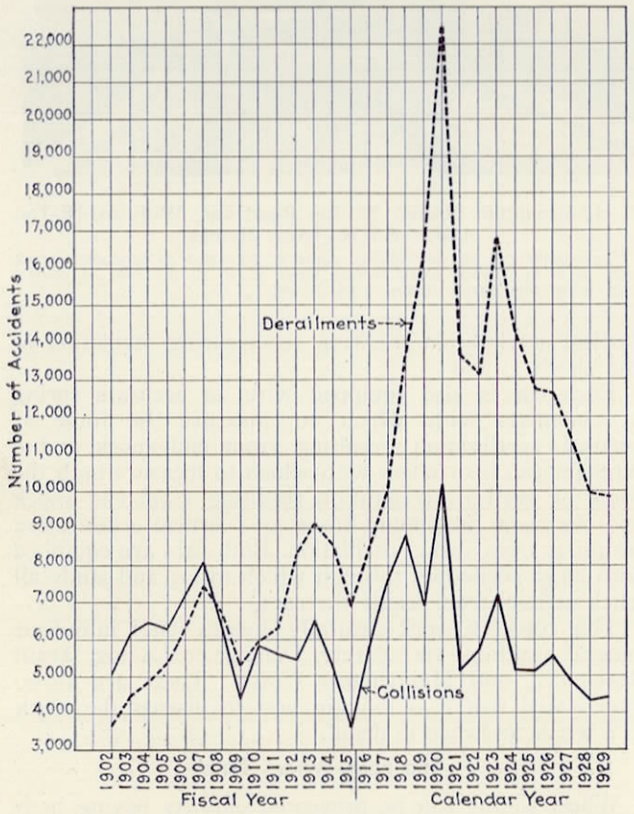
* A description of the improved Boyden six wheel coordinating truck was published in the September 20, 1924, issue of the *Railway Age*, page 487.

wheel centers on one truck. By "warp" is meant the amount that one point on the rails is out of the plane of the three other rectangular points on the rails. The flexibility of the A.R.A. standard truck is always sufficient to permit one truck wheel to go down into a maximum-depth low joint without losing its share of the load on this side of the truck.

Swiveling Resistance—There is no swiveling resistance between the trucks and the car body except on approach curves with changing radius. The following table gives the results of tests to determine the maximum swiveling resistance under various truck conditions, with the track warped to put excessive loads on one side bearing. It shows the pressure required at the wheel flange to swivel one A.R.A. standard truck of a fully loaded 55-ton box car with the weight concentrated on one side bearing.

	Pressure, lb.
With friction side bearing	20,870
With roller side bearing	5,820
With T. H. Symington bolster	270

It is realized that this excessively warped track is found only occasionally in industrial yards, but the identical swiveling resistance is often encountered on



Comparison of Number of Accidents Caused by Derailments and Collisions

main-line approach curves when the car body has rolled over to one side bearing.

Derailments—Most freight-car derailments occur when entering or leaving curves because, at these points on the line, the curve radius is changing and we have the combination of high flange pressure against the outside rail and minimum weight on the derailing wheel. On entering a curve, it is the rear truck that derails, and on leaving a curve, it is the leading truck that derails. The total flange pressure on approach curves is made up from the following three factors: The pressure necessary to slide truck wheels, to swivel the truck, and the lateral component of car-body roll.

When the car body rolls toward the outside rail, there is a maximum flange pressure because all three factors of pressure are involved. This pressure may spread the track, break the wheel flange or shear off the journal-box-brass lugs, but never causes a derailment because, with standard cars, 85 per cent of the body weight is then on this side of the truck.

When the car body rolls toward the inside rail, only the first two factors of pressure are involved, but the outside wheel will sometimes derail because then only 15 per cent of the body weight is on this side.

The following table gives the results of tests to determine the derailing tendency on approach 10-deg. curves with different trucks on warped track representing a soft spot at the outside rail, when the load (rigid 55-ton box car with 18-ton load) was on the side bearing adjacent to the inner rail. Here, also, only the first two factors of pressure are involved.

	Side-bearing clearance, in.	
	0	⅛
	Track warp, in.	
A. R. A. standard truck with A. R. A. standard bolster	1 9/32	2 3/16
A. R. A. standard truck with T. H. Symington bolster [1]	6	

[1] With this bolster there is no side-bearing clearance, and the truck will not derail until the body bolster comes in contact with the side-frame.

Self-squaring—It is obvious that, on tangents, minimum train resistance and flange wear result when the trucks are square and the flanges do not drag on the rails. Any design that will square a four-wheel truck after coming out of a curve and keep it square is worth considering.

Any truck that will prevent the wheel flanges from exerting high pressure, first against one rail and then against the other, is worth considering, because both rain resistance and flange wear are involved. This surging results from either car roll or car nosing. If side-bearing clearance is large, cars are apt to roll excessively. If too small, cars with standard trucks will nose.

Car Roll and Nosing—If the synchronous impulses from the rail joints are not sufficient to cause objectionable car roll, the truck will see-saw on its center plate, when there is sufficient side-bearing clearance, and not disturb seriously the mass of the car body.

If side-bearing clearance is a minimum or at zero, these vertical rail-joint impulses directly affect the car body mass with resulting nosing. This nosing originates from the car body. If side-bearing clearance is lacking, the truck cannot rock independently of the car body, and synchronous impulses from the rail joints will alternately compress the truck springs on opposite sides of the car. The lateral component of this action causes the car body to swing first to one side and then the other. This action occurs on all passenger cars. Without an easy lateral float of the car body on the trucks, the lateral movement of the car body will cause the trucks to surge first against one rail and then against the other and result in rapid end wear on brasses and journals. This nosing has the same period as car roll, and can therefore be identified with the synchronous timing of the rail joints at certain definite train speeds, often about 17 m.p.h.

Car roll can be reduced by reducing side-bearing clearance and by increasing the stiffness of the truck springs. Car nosing can be eliminated by increasing the side-bearing clearance or, with minimum side-bearing clearance, by providing a soft, easy lateral motion.

Either construction will break up any objectionable synchronous nosing action of the car body and truck in tune with the rail joints.

Safety—We have taken adequate care to prevent accidents resulting from the truck by providing ample strength in the side frames and bolsters and in providing safety supports for the brake beams. We have done

nothing to the trucks to eliminate derailments and to solve the broken-wheel-flange problem. An analysis of these problems indicates the need for better cross-equalization to prevent derailments and an adequate lateral motion on all freight-car trucks to minimize lateral shocks.

Guard-Rail Shocks—Car roll, or car nosing, will often take up all lateral clearances between the car body and the collar of one journal. If, at this instant, the opposite wheel flange strikes a guard rail at speed, something must yield in the line of force from the blow at the guard rail to the body mass, namely: The guard rail, wheel flange, journal collar, stop lugs on the brass, the side frame, bolster or the car body.

If the blow is taken by the opposite journal shoulder, the force must pass through the top flange on the brass, and through the wedge to the roof stop lugs on the box on the same side of the truck as the offending guard rail.

This is nothing but a force of lateral acceleration. If we consider the weight on the rails of one truck of a fully loaded 55-ton car as 100, the body weight on one truck is 90 and the truck weight is 10. With adequate lateral motion, the mass to be laterally accelerated at one instant is the truck only, or 10, and the velocity of the lateral acceleration of one wheel is in direct proportion to the speed of the train and the entering angle of the guard rail. If we consider that, for a certain speed and guard rail, this lateral wheel velocity is 2, the lateral velocity of the center of gravity of the truck mass is 1. Then MV^2 for the truck = 10.

With a similar car, without lateral motion, we must add the force to laterally accelerate one-half of the car body with load. In this case the body mass equals 90 and the lateral velocity is 1, because, at any one instant, this lateral velocity of one-half of the car body is one-half of the lateral velocity of the wheel striking the guard rail. Then MV^2 for the car body equals 90 and the sum of the two equals 100.

There are several factors of correction, namely, the lateral yield in the truck structure, the force needed to compress slightly the truck springs because of the small lifting angle of any lateral motion, and because the lateral force on the car body is applied at the center plate some distance below the center of gravity of the car body. We are certain, however, that the force of lateral acceleration at the guard rail without lateral motion is many times this force when we have adequate lateral motion. The same advantages accrue from adequate lateral motion when the dynamic shock comes on the throat of the wheel flange.

If we can, with suitable lateral motion, greatly reduce this dynamic force, we automatically increase the factor of safety for the wheel flange many times and therefore largely eliminate broken wheel flanges.

If the wheel flange is strong enough to stand the shock, the brass is sometimes broken.

It would seem essential, therefore, that any lateral motion provide sufficient travel and gravity resistance so that there is *always* an ample reserve of yield to insure the minimum shock to the wheel flange.

It is fortunately a rather rare coincidence when a wheel flange strikes a guard rail at speed at the instant when all lateral clearances are absorbed in the opposite direction.

There is no doubt about the fact that there are many lateral shocks that are not sufficient to break a wheel flange or shear off the brass lugs, but are sufficient to break down the oil film on the journal collar, or shoulder, with resulting rapid end wear on brasses and journals.

An adequate lateral motion must accomplish two separate important functions: The floating action at the center must be easy in order to prevent nosing when side bearing clearance is at a minimum, and there must be sufficient travel and gravity resistance to insure lateral yield under all operating conditions and to prevent the bolster from striking the side frame.

This subject can be studied best with the swing-hanger construction used on all passenger cars, which operate with little or no side-bearing clearance. These hangers vary in length from 28¼ in., spread 8¾ in. at the bottom, to the equivalent of 6½-in. parallel hangers.

No matter what design is used, it is always a compromise to give the best results to eliminate nosing and provide sufficient yield and resistance.

With angular hangers, the bottom spread must be small to eliminate nosing and increased to give sufficient lateral resistance. If parallel hangers are used, they must be long enough to eliminate nosing and short enough to provide sufficient resistance in the usual travel of 2¼ in.

It is a good practice on a straight railroad to provide best against nosing, and on a crooked railroad to consider lateral resistance as of first importance. Pullman cars that operate on all sorts of railroads probably offer the greatest difficulty in this compromise between nosing and needed resistance.

An ideal hanger for all passenger cars would seem to provide a compound lift curve to produce an easy float at the center and ample lift toward the end of the motion. It has been demonstrated that 6½-in. parallel hangers will induce little nosing on passenger cars with no side-bearing clearance. The reason is that combined helical and elliptic springs have a flat load curve, and therefore largely absorb the effect of track irregularities without disturbing the car body.

On freight cars, with only helical springs, track irregularities are more readily conveyed to the car body, and an easier lateral motion at the center than on passenger cars is required to prevent the car-body swing from carrying the trucks with it.

One objection to all swing hangers is that the lateral motion is continuous and the millions of movements necessitate a periodical renewal of pins and bushings in the hangers on account of wear.

With properly designed rockers, there is no sliding friction and the parts will last, with no deterioration, for the life of the car. When rockers, or rollers, are used for lateral motion, experience has shown that the car should be equally stable with the weight evenly distributed on the bolster, or concentrated on one rocker, which often occurs with rigid-body cars. This means that one rocker should give equal lift each way from central position. It is also important that the rocker-wear factor, viz., the product of its radius by its length, be sufficient to insure long life with ordinary steel rocker bearings.

Additional Research

When the writing of this paper was undertaken, it was believed that this entire research could be completed in time to tabulate all the results. Unforseen delays have made this impossible.

It is considered premature to comment on truck-spring performance at this time. We first must get the record of performance of all types of truck springs at all speeds up to 60 m.p.h., and with various ladings. No tests have yet been made to measure the magnitude and frequency of lateral forces or of the effect of vertical spring oscillation on perishable freight.

An exhaustive program for joint freight-car-truck research has been arranged between several of the larger

manufacturers of trucks and springs and one of our important railroads. The results of this work cannot be included in this paper, but will, at a later date, be made public.

Discussion

Most of the discussion dealt with sprung oscillation and various phases of sprung design. In addition to this discussion of a more or less detail nature, W. P. Borland, director, Bureau of Safety, Interstate Commerce Commission, stressed the need for improvements in the present design of car trucks from the standpoint of safety. Derailments, he said, were the most prolific sources of accidents. He compared the accident records for the periods from 1902 to 1911 inclusive, and for 1920 to 1929 inclusive. During the first period, he said, there were 61,329 collisions and 56,136 derailments; during the second period there were 57,382 collisions and 136,758 derailments, a decrease of 3,947 collisions and an increase of 80,622 derailments. The property damage from collisions for the first period, he said, was $48,235,952 and for the second period $57,450,943, an increase of less than $10,000,000; from derailments, $48,965,656 for the first period and $159,635,736 for the second period, an increase of more than $110,000,000. It should be borne in mind, Mr. Borland said, that these amounts refer only to damage to railway property and do not include amounts paid for lost or damaged lading, personal injuries or other claims growing out of such accidents.

In a further examination of the accident record for the year 1929, Mr. Borland stated that of the total of 9,871 derailments reported, 4,510 were due to defects in or failures of equipment, while only 2,080 were due to defects in or improper maintenance of way and structures. There were 6,643 train accidents due to defects in or failures of equipment, of which 1,342 were attributed to trucks and 1,867 to wheels and axles. (Tables 63 and 65, Bureau of Safety Accident Bulletin No. 98.)

In considering all of these statistics, he said, the fact should be borne in mind that they include only those accidents which resulted in death, personal injury or property damage amounting to $150 or more. It is a matter of common knowledge that there are a large number of similar accidents not sufficiently disastrous to be included in these statistics but which are a constant source of delay and expense to the railroads and of trouble and worry on the part of railroad operating officers.

Research work of the character conducted by Mr. Symington, Mr. Borland stated, is therefore directed along lines which should be productive of important results. It is of direct interest to the Bureau of Safety, Interstate Commerce Commission, and should certainly enlist the active support of railroad officers who are responsible for the design, construction and maintenance of cars and for safe, efficient and economical operation of the railroads.

THE DIFFERENCE BETWEEN AIR AND STEAM.—A gasoline passenger car, having an air whistle, but no steam whistle, is not subject to the Massachusetts law requiring the steam whistle to be sounded for a highway crossing; and the Supreme Court of that state has reversed a verdict against the New York, New Haven & Hartford in a case where such a car caused the death of two persons in an automobile. The case hinged on the question of the failure of the engineman to give the statutory signals. Having no steam whistle, the engineman could not sound a "statutory" signal and therefore, apparently, he, as well as the railroad, was exonerated from all blame.

New Design of Steel Office Furniture

A NEW suite of steel office furniture is offered by Remington Rand Business Service under the name of "Ambassador." The line includes executives' desks, typewriter desks, tables and various styles of chairs.

Among the features included in this furniture is a conduit provided for telephone, desk lamp and call-buzzer wiring, permitting the hiding of the leads to these accessories. In addition, through co-operation with telephone engineers, properly spaced holes on the inside left pedestal have been tapped to permit rapid mounting of the telephone bell box. The writing bed is covered with heavy linoleum—plain, or grained to match the desk finish. The furniture is offered in walnut or mahogany finishes. All hardware is of statuary bronze.

Mexican National Plan Supported by Government

(Continued from page 282)

reached a point where the Government felt is necessary to take a hand in the matter.

"The Goverment's attitude is based upon the fact that the National Railways system constitutes the most complete and rapid means of communication for about two-thirds of the area of Mexico and serves the great majority of the inhabitants, whose interests are closely and more or less directly connected with the proper operations of the railways," President Ortiz Rubio continued. "In the second place, the government is a stockholder and should participate in the financial obligations of the company. Any failure that is brought about by the company reflects upon the national interests invested in the enterprise and is a responsibility of the government. Although the material interests of the country in the railroads are considerable, they are much less than the moral interests, which have been considered by the government as an important factor in the economic independence of the country.

"In the third place, the government considers itself legally and morally obliged to support the National Railways in their financial rehabilitation. It takes this attitude because the prolonged control of the railways by the government in order to benefit public welfare and the laboring classes has brought about financial and administrative sacrifices on the part of the railway company, creating extraordinary expenditures. As a result, the earnings of the company have not kept pace with the operating expenses, because the economic crisis has retarded the intensification of the development of the material resources of the country, and because in some cases the concessions extended have been too limited, and the national interests have been injured."

President Ortiz Rubio also stated that the control of the stock of the National Railways by the Mexican Government is a guaranty that it is not the government's desire to protect a capitalistic enterprise by its intervention in the reorganization. He added that the government will allow only a just and equitable return to foreign investors, dedicating the balance of the earnings of the Railways to the betterment of laboring classes.

A Dairy Herd on the Canadian Pacific Supply Farm at Strathmore, Alberta

Developing Canada's Resources

Canadian Pacific aids immigration and looks after prospective settlers

LACK of population has been one of Canada's chief problems for many years. Many of the resources of the Dominion have lain fallow because of lack of man-power to develop them. Realizing this, the railways of Canada have established immigration and colonization departments on an unequalled scale.

Today, immigration regulations are framed in such a way as chiefly to promote the settlement on the land of agriculturists, agricultural workers, female houseworkers and boys for the farm. In conforming to this policy, the department of immigration and colonization of the Canadian Pacific works energetically to secure settlers of a good type and also to attract from other countries capital to promote Canadian development and to further national progress in every possible way. Its widespread organization is directed from a central headquarters at Montreal. Since the beginnings it has been directly responsible for the settlement on Canadian farms of more than 60,000 families, who have occupied and cultivated 31,000,000 acres of land.

Activities in Europe

In the British Isles, it maintains several district offices, each in charge of a district representative and colonization agents. Representatives are maintained at 11 points on the European continent, and these, together with 50 agencies at points in the British Isles and Europe, come under a sub-headquarters organization in London. Through these agencies in the British Isles, every effort is made to induce the largest possible number of suitable Britishers to come to Canada to settle on the land. The expenditures in this sphere of activity in the British Isles, in the endeavor to interest and make Canada known to such British, are many times as large as those expended on the European continent. In the United States, four district offices and nearly 200 agencies are maintained, all reporting to the superintendent of colonization at Winnipeg, who in turn reports to Montreal.

There are offices throughout the Dominion. Special port colonization agent's offices are maintained at ports of debarkation. The colonization agents meet all ships and assist colonists on their arrival, helping them with the routine matter of customs examination and checking of baggage—and also seeing them away to their correct destinations. The Maritimes, Quebec and Ontario are covered by district offices at Montreal, Kentville, N. S., and Toronto, while the headquarters of the western organization is at Winnipeg, with district office covering the Province of Manitoba. Offices at Saskatoon and Moose Jaw deal with colonization matters in Saskatchewan, Calgary, Edmonton and Peace river for the province of Alberta, and Vancouver for British Columbia. At all these offices are officers who have had many years' experience in colonization work.

Selection of Colonists

It is the duty of all representatives of the department to meet requirements as directed through headquarters, and they must satisfy themselves so far as it is humanly possible to do so that the people to be sent forward are of the proper type and have the necessary experience; understand the conditions under which they are coming to Canada; and, in certain countries, it is required that those who come forward sign a declaration form certifying that they understand the conditions under which they have been selected to come to Canada and that they will abide by them. Canadian government officers, of course, pass upon each person as to fitness from a civil and medical standpoint before they leave for Canada.

In the United States, representatives of the Department are continually in receipt of inquiries as the result of advertising Canada, and they must either reply fully by letter to inquirers or, through inspectors, have them fully interviewed. Each office has its inspectors and agents, who acquire a knowledge of those in their territory who contemplate moving to Canada. When they finally move they are often accompanied by traveling representatives who remain with them until they have completed their trip of inspection.

Bureau of Canadian Information

During the past few years, the department has maintained a Bureau of Canadian Information at Montreal, with branch libraries in Great Britain and elsewhere and has advertised its willingness to supply information on Canadian conditions. Thousands of inquiries reach headquarters and branches every year. The information asked for covers all phases of Canadian activity. The libraries keep abreast of the times by being in receipt of up-to-date publications and statistics on various subjects. Requests come from widely separated countries, commercial and industrial organizations of all kinds, colleges, individual students and many other sources.

A 20-page publication under the name of "Agricultural and Industrial Progress in Canada" has been issued

A Group of Immigrants Arriving from England

by the department in steadily increasing quantities since 1919 and circulates to 45 countries of the world in monthly issues of 14,500. This publication is not distributed indiscriminately, going only to those who request it. Many of the articles contained therein are reproduced in newspapers and periodicals. Its object is to encourage development and to attract capital and desirable settlers to Canada by continually directing attention to opportunities in the Dominion. As a supplement to this, a weekly sheet of progressive news items is published in issues of 6,000. It is in handy form for newspaper insertion, technically known as "fillers" and plays a not unimportant part in keeping the progress of Canadian affairs before the public.

Large libraries of motion picture films illustrating various phases of Canadian colonization and development are kept at Montreal, at the headquarters of the European organization, also in the United States and at Winnipeg. These are available upon application, for use by boards of trade, colleges, clubs and other organizations.

In the year 1924, the Canada Colonization, with headquarters at Winnipeg, was made a subsidiary of the Department of Colonization and Development, for the purpose of encouraging the settlement of privately owned lands along the lines of the Canadian Pacific.

In the first seven months of its existence it placed 370 families on 108,000 acres of land in the Prairie Provinces—1925, 707 on 150,605 acres—1926, 711 on 162,535 acres, in 1927, 625 families consisting of 3,443 persons on 162,982 acres and in 1928, 567 families on 125,562 acres. By the end of 1929, the total number of families settled by the Canada Colonization Association reached 3,500. The influence of this more recent factor in Canada land settlement deserves attention, as the assimilation of these families has been extraordinarily successful.

One of the most encouraging features in the effort to solve the problem of insufficient population, has been the establishment and successful work of the local colonization boards. These boards are composed of farmers, merchants, bankers and other public spirited citizens, and some are affiliated with boards of trade and other civic bodies. The local colonization board concentrates upon the development of its immediate district. It informs itself of settlement opportunities for prospective purchasers or renters in its territory, the farm laborer and female domestic requirements of those already settled, the nationalities required, wages offered, terms of employment and other such details. Farm listings with their detailed information are filed with the Canada Colonization Association, the subsidiary mentioned in the preceding paragraph, and this information is always available to prospective settlers. The Department of Immigration and Colonization does everything possible to meet the other requirements as presented by the boards.

The local colonization boards have done an eminently valuable and practical work both from the standpoint of the country itself and for the good of the newcomer. From the day of his arrival, the colonist can feel that his neighbors are really interested in him. He is welcomed to the district by officials of the Colonization Board, who thereafter keep a kindly eye on him, ready to give him practical advice and help in his initial efforts to become a citizen of value to the Dominion of Canada.

Sponsored first in the West, this movement has extended to the East and, at the present time, there are in existence 161 such boards actively operating and performing work of national significance and great economic and social value.

Ready-Made Farms

To meet the peculiar needs of British settlers, the company originated the scheme of ready-made farms. The first colony was prepared at Nightingale, 12 miles north of Strathmore, Alberta, comprising 25 irrigated farms of 80 acres each. On each of these a house and barn were erected, the property fenced and a well dug. A portion of the land was broken, disced, harrowed and part of it seeded to crop, ready for the arrival of the settlers. In the next years similar colonies were prepared at: Namaka, Sedgewick, Wolfe, Winyard, Gem and Tilley, and later, at two points in British Columbia, and after the war, two soldier settlement colonies at Coaldale.

As a practical demonstration of the possibilities of prairie soil, as well as to stimulate the ambition of new settlers by showing examples of what they could raise on their own farms, the company early created demonstration farms in the west. These experiments were carried out by experts and the results made known to farmers who were unable to do this experimentation themselves. In addition, to encourage mixed farming, as being ultimately the most assured and prosperous kind of agri-

culture, a number of farms were established to prove its benefits. They were operated on practical lines well within the means of ordinary farmers and had valuable results in the surrounding districts.

The demonstration farms at Brooks and Strathmore in Southern Alberta still continue their useful work. The mixed farms, having achieved their object, were disposed of to practical farmers who carry on the work on the lines originally laid down by the company.

The Strathmore farm has a second object which has been developed to a high degree. It serves the dining cars with fruits, flowers, dairy products, chickens, bacon and ham. The herd of pure bred dairy cattle on this farm is famous. The company's mutton and pork supplies come from herds of Suffolk sheep and Berkshire swine. Its thoroughbred bulls are loaned for breeding purposes.

Irrigation

The Canadian Pacific has lavished expenditure on irrigation quite unprofitable to itself, which would have been a heavy burden on the taxpayer if the government had undertaken it. This system has proved that even that part of Canada apparently doomed by uncertain rainfall to agriculture failure, could be successfully transformed into a splendid source of national revenue, and as a result of the ultimate success of the Canadian Pacific's irrigation block, other private organizations and the provincial government of Alberta have embarked upon irrigation projects now operating and rapidly settling.

The area known as the Canadian Pacific Irrigation Block is roughly 150 miles long by 50 miles wide. It is divided into western, central and eastern sections, the western being fully settled, the central not yet undertaken and the eastern under settlement. Diversion dams were built at Calgary and Bassano, and natural reservoirs at Chesterton Lake, near Calgary and Lake Newal, near Brooks, were brought into utilization. Water is supplied from the Bow river. The total area of the block is approximately 3,000,000 acres, of which some 625,000 are irrigable.

Some idea of the magnitude of the work comprised in these two sections is apparent from the fact that, in the distribution of the water, it passes through more than 4,000 miles of main and secondary canals and distribution ditches in order to serve farmers settled on the land. Approximately $20,000,000 has been expended upon this undertaking.

Exhibits Branch

The exhibits branch of the department has in recent years displayed in many countries magnificent exhibits illustrating Canada's natural resources. Chief among these were the British Industries Fair at Glasgow, the Tokio—Peach Exhibition, the British Empire Exhibition at Wembley in 1924 and 1925, the New Zealand and South Seas Exhibition at Dunedin, N. Z., and the Sesqui-Centennial Exposition, Philadelphia. In addition, it maintains permanent attractive displays in offices in Great Britain, the United States and Canada. These consist of display cases containing grains, grasses, fish, animals, birds, forest products and hand-colored transparencies, featuring agricultural and industrial development, as well as scenic features. Annually, the branch exhibits at the Canadian National Exhibition, Toronto, and at Quebec, Sherbrooke and other Canadian points. In addition a fine exhibit is maintained at the Chateau Frontenac, Quebec, which contains, in addition to exhibits of agricultural and mineral resources, objects of art from the Orient and other parts of the world and mechanically moving models illustrative of principal Canadian ports and other places of interest.

Western Pacific To Enter San Francisco

WASHINGTON, D. C.

AN entrance into San Francisco for the Western Pacific, the transcontinental route of which it forms a part, and ultimately for the Great Northern upon completion of its extension south from Oregon to a connection with the Western Pacific, is provided for in a report and order made public by the Interstate Commerce Commission on January 27 authorizing the Western Pacific California to build its proposed line from San Francisco south to Redwood City, Calif., and thence from Redwood City to Niles, via bridge across San Francisco Bay, a total of 39 miles. The line also includes a branch from Redwood City to the plant of the Pacific Portland Cement Company, 2 miles. The authority was given, however, only on condition that the bridge and trackage on each side be constructed only in case the Western Pacific subsidiary is unable by April 1 to secure from the Southern Pacific trackage rights over its Dumbarton bridge and adjacent trackage on reasonable terms subject to the commission's approval, and that no portion of the line between San Francisco and Redwood, 22 miles, shall be operated until either the portion between Redwood City and Niles is covered either by construction or trackage rights so as to give the Western Pacific a continuous line from San Francisco to Niles. The order also requires that trackage rights over the line be granted to any other railroad operating 250 or more miles of line desirous of thus securing an all-rail entrance into San Francisco for the purpose of gaining access to its own or other terminals in that city.

Authority was also granted to the Western Pacific to operate over the Quint Street Line in San Francisco, which is owned jointly by the Santa Fe and the S. P., either through acquisition of an undivided half interest or under agreement with the present owners.

The main line of the Western Pacific now terminates at Oakland, Calif., across the Bay, from which its cars are transported to San Francisco on car barges, and the construction of the new line, which is to be used for some time for freight traffic only, will save considerable time in the delivery of cars. The Southern Pacific vigorously opposed the application for authority for the new line and offered to haul the Western Pacific cars from Niles to San Francisco and South San Francisco at $17.50 a car. The cost of the new line from San Francisco to Redwood City was estimated at $4,167,786 and that of the line from Redwood City to Niles, including the bridge, at $3,829,567, and the report says that 11.57 miles of construction could be saved and the cost reduced by $3,605,000 by use of the Southern Pacific line. Commissioner Eastman, concurring, objected to the use of a subsidiary company to build the line, and Commissioner Meyer dissented on the ground that the Western Pacific has undertaken an aggressive policy of expansion, the wisdom of which is doubtful, and that a safer and more prudent policy would be to accept the proffered aid of the Southern Pacific until the necessity for new construction into San Francisco can be more persuasively shown.

THE SOUTHERN KANSAS STAGE LINES has filed a protest with the Kansas Public Service Commission, seeking to prevent the St. Louis-San Francisco from placing its proposed 2-cents-a-mile passenger rate in effect in Kansas.

PENNA. INTERESTED IN MERCHANT MARINE*

Favors rail-ship co-ordination—urges repeal of prohibitions of Panama Canal Act against railway operation of ships

George D. Ogden

By George D. Ogden
Assistant Vice-President, Pennsylvania

EXCEPT for the prohibitions in the Panama Canal Act—which we believe to be unsound and uneconomic and hope ultimately to see removed in the public interest—Congress has unmistakably set the seal of its approval upon co-operation and co-ordination between rail and water carriers in the development of ocean trade. This may fairly be deduced from the language employed by Congress in both the Transportation Act of 1920 and the Merchant Marine Act of the same year.

The Pennsylvania Railroad management has always believed the principle to be a thoroughly sound one, and that one of the most effective ways of putting it in practice is for railroads to become interested as investors in shipping lines operating from the ports which they serve. Such investments of course must be made upon the basis of good business judgment, in the support of lines soundly planned, financed and managed, and offering the prospect of a satisfactory return upon the capital utilized.

Investments in Two Steamship Lines

Guided by such considerations, the Pennsylvania Railroad has recently made substantial investments in two steamship lines engaged in foreign commerce. One is the American Scantic Line, connecting Philadelphia, Baltimore and New York with certain Scandinavian ports. This line has been in operation for some time and is a successful venture. It has built up a satisfactory traffic, which offers every prospect of further sound growth, and it is earning a profit.

Our other ocean shipping investment is in the Baltimore Mail Steamship Company, which was promoted by interests of that city to establish weekly sailings for passengers, mail and fast freight from the ports of Baltimore and Norfolk to Hamburg, calling at Havre and Bremen. We were invited to participate in the financing, and did so by becoming one of the subscribers to the capital stock. The line has not yet started service, but we carefully studied its prospects before committing ourselves. We are satisfied that a real need for it exists, and that traffic will be forthcoming to make it a remunerative and successful business enterprise.

Before the Baltimore line was proposed, we announced to the business interests of Philadelphia that our company stands ready to participate in financing a direct line from that city to European or other foreign ports, provided the enterprise is soundly planned from the viewpoints of financing and physical operation, appears to meet a real transportation need, and is assured of efficient and experienced management. We have repeated this offer on several recent occasions, and it stands open today. We should be delighted to have it taken up and the establishment of such a line from Philadelphia energetically pushed.

Rail-to-Keel Terminal Fosters Co-ordination

At the port of New York we have just opened and dedicated to the use of the steamship and exporting interests very important additions to our waterfront facilities. I have reference to our new rail-to-keel terminal at Jersey City.

The Pennsylvania Railroad has participated in the traffic of New York harbor for 60 years. During that time we have repeatedly enlarged and added to our piers and other facilities to keep pace with the growth in the port's business and progress of the great cities on both sides of the Hudson river and bay. It has been our constant endeavor at New York harbor, as at all the other ports which we serve, to keep in advance of actual needs and to anticipate the requirements of an ever increasing flow of commerce, so that the movement of traffic should at all times be free and unhampered.

Most of the freight delivered to vessels at New York harbor has always been lightered and will doubtless long continue to be on account of local conditions there existing. The railroad management, however, has for some time realized that in the case of certain forms of traffic there has not only been a demand but an actual need for connecting our rail service with steamship transportation in a more direct and efficient manner than has been possible with the facilities hitherto existing. This led to the planning and building of our new rail-to-keel terminal at Jersey City. It is the most modern facility of its kind in the world and certainly the equal of any other on either side of the Atlantic in convenience and economy of operation.

* An address delivered on January 22 at the Fourth National Conference on Merchant Marine, Washington, D. C.

The terminal will ultimately include three large covered piers, of which two, "D" and "F," have been constructed and are now in service. They are utilized by two American steamer lines, one the American Scantic Line, to which I have already referred and which reaches Scandinavian ports, and the other the American Export Line, operating to Mediterranean ports.

The advantages offered by the terminal may be briefly described. From the viewpoint of the steamship owners, one of the chief attractions is that of the direct loading or unloading between vessel and car without intermediate transportation. This reduces to a minimum the expense of taking on a cargo and also the time that the vessel is tied up for loading, and berthed for cargo. When we consider that the operation of a modern freight steamer represents an expenditure of several thousands of dollars a day during the time it is in commission and that the greater part of these expenses—represented by wages and maintenance of the crew, and interest on the investment—continue whether the ship is moving or not, the importance of time saving made possible by the direct loading feature of the rail-to-keel terminal becomes evident.

The depth of water at the slips adjacent to the piers is sufficient to accommodate the largest vessels afloat engaged in regular freight service. There is, therefore, no handicap in the type of vessel operating at the port of New York which can use this new terminal for direct loading.

Savings to Exporters and Vessel Owners

The exporters, as the owners of the freight, share with the vessel owners in the advantages I have just briefly outlined. Of particular interest to exporters is the fact that merchandise will require very little handling, with resulting great reduction in the liability to loss and damage or improper loading. The fact that both piers "D" and "F" are covered offers merchandise of every sort complete protection from the weather in all seasons of the year and under all conditions.

Pier "E," which is to be constructed later, and which will increase by approximately 50 per cent the present vessel loading capacity of the rail-to-keel terminal, will also be covered. It will offer to vessel owners and exporters the same conveniences, advantages and economies in the handling of cargoes as are now provided by piers "D" and "F."

Beside building the new piers "D" and "F," with pier "E" planned for the future, we have extensively reconstructed and re-equipped the adjacent pier "H" as an open facility. Upon it we will place a modern gantry crane for the direct transfer of heavy lift cargo from open cars to the vessel's hold. This rounds out our new and improved facilities at Jersey City and places us in a position to handle direct from rail to keel any form of merchandise cargo coming to the port of New York, in any quantity to meet the needs of the export trade, and with the greatest possible speed, efficiency and economy of operation.

Back of the new rail-to-keel terminal some of our friends who specialize in cold storage have erected a magnificent plant for that purpose. It will make the new terminal particularly attractive to exporters of packing house products, apples, citrus fruits and other perishables. Freight of this character can be taken from the cold storage warehouse, only a stone's throw from the piers, and placed under refrigeration in the vessel with such speed that it would hardly be an exaggeration to call the operation practically instantaneous. Even in the hottest weather there will be no exposure to the sun and no reason for subjecting even the most delicate products to risk of deterioration in the process of transfer from storage to ship.

While we anticipate that this new rail-to-keel terminal at Jersey City will attract a very large business—indeed it is already doing so—we expect to continue in operation our other facilities on New York harbor, including those at Greenville, N. J., where we have for many years maintained facilities for floating or lightering freight to vessels unable to berth at the piers by reason of the depth of water. As I indicated a few moments ago, the requirements of traffic in New York harbor are such that the demand for lighterage facilities appears likely to continue indefinitely. The opening of the new Jersey City export terminal will therefore not affect our arrangements for continuing to serve the export trade at Greenville.

Confident of Future Traffic Growth

It may be appropriate for me to add, before leaving this subject, that the large expenditures we have made at the Jersey City rail-to-keel terminal, furnish one more evidence of the faith entertained by our company's management in the future of the railroads and in the growth and expansion of our traffic. It may justly be interpreted as an emphatic vote of confidence in the future of the nation's commerce, and particularly its export trade, as well.

Another important step taken by the Pennsylvania Railroad, in recent years, has been the establishment of general freight agencies in leading cities of Europe for the encouragement and upbuilding of American export and import traffic and to render assistance to shippers on both sides of the Atlantic in making their transportation arrangements. Points at which these agencies are established include Turin and Milan, Italy; Basle, Switzerland; Paris, Antwerp, London, Liverpool, Glasgow, Berlin, Hamburg and Bremen. Sub-agencies, reporting to the general agencies, have also been established through the entire United Kingdom and Europe. In addition, we maintain an office in Mexico City.

The attraction of passenger traffic to and from this country is an object of great interest to the Pennsylvania Railroad, both for the revenues which accrue to us from the resulting rail transportation and for its general effect in promoting business activity and increasing the prosperity of the country and its merchant marine. For this purpose Thomas Cook & Sons have been appointed our general agent throughout Europe and elsewhere in the world, outside of the United States.

Our traffic agencies in all countries are directed to maintain the closest contact with the freight commissioners of our Department of Commerce, and through that means their activities contribute directly to the support of the American merchant marine.

Repeal Panama Canal Act Prohibitions!

In closing may I revert again to the limitations of the Panama Canal Act? It is the belief of the Pennsylvania Railroad management, and has been repeatedly so stated, that railroads, in the public interest, should be at liberty to extend the scope of their service in such manner as to utilize any form or agency of transportation for which there is a public need and demand. In other words, we are thorough believers in the principle of coordinated transport.

If it is desirable for railroads, by their participation and support, to encourage foreign commerce in ships flying the American flag, does it not seem logical that they should have the same opportunity for useful service in connection with the coastwise and intercoastal trade? Is it not equally logical that the Great Lakes

should again be open to them, as was the case for many years prior to the passage of the Panama Canal Act?

Going a step further, while the subject is somewhat outside the scope of the problems which this conference has been called to discuss, does it not seem just as proper and desirable, and in the public interest, that the railroads should be permitted to establish service upon the inland waterways built and maintained by the government out of taxation? Transportation is the sole purpose and business of railroad companies. It is the object for which they are chartered and franchised. Reasoning from these premises, how can we avoid the natural conclusion that railroads would be better situated than any other agency in the country to make a success of transportation service on these inland waterways, particularly as the barge lines could be operated as facilities supplementary to, and auxiliaries of, the rail lines?

Yet we find this strange anomaly; that as a result of the provisions of the Panama Canal Act, reinforced by those of the Denison Act, the railroads are the only forms of enterprise in the country specifically forbidden to use the inland waterways. Though barred from their direct use, however, the railroads suffer the additional injustice of being compelled to make through rates with the inland waterways, at less than rail rates, thus short-hauling themselves and cutting their own revenues. This seems not merely an act of injustice but distinctly harmful from the viewpoint of public welfare and efficient transportation service. It is a situation which we sincerely hope to see remedied.

I think I am perfectly safe in saying that this is the attitude of our railroads in general, and that they will welcome any encouragement coming to them from governmental sources to extend the scope of their cooperation upon sound business principles.

"Unfair Competition" Hearings Draw to Close

(Continued from page 288)

May 16, 1927, in which R. Hackett, western freight traffic manager of the New Haven, wrote to Mr. Campbell, vice-president of traffic, in part as follows:

> There never has been a case since the opening of the Chicago office where the assistance of the purchasing department is so necessary in protecting our companys interests. We are receiving from Armour & Co. an average of 20 cars of competitive freight a week.....Ellis may have to take arbitrary action if the Boston receiver is not responsive to our representative .....I realize that for years we have been using the Miner draft gear but believe in this case it is desirable to favor the Waugh Company.

Mr. Ellis said that he had intervened on the New Haven because there was a closed door against Waugh and that all he did was to ask a fair hearing for that draft gear, Mr. Pizzini having so reported to him. He stated that he had not authorized the statement made in the letter.

He said he had requested the Wabash to have an investigation made also, in view of the report made by Mr. Pizzini to him of unfair treatment. His attention was then called to the situation on the Chicago, Milwaukee, St. Paul & Pacific, as indicated by letters in the record, including one letter, dated April 11, 1928, in which the vice-president of traffic, writing H. A. Scandrett, president, said in part:

> I am a little disturbed with reference to the position the Armour people take regarding our use of the Waugh-Gould draft gear rigging on the new cars. Mr. Ellis is very insistent that he be given a representative portion of the business and he interprets it as a minimum of one-half.....He maintains that anything less than one-half is unfair and I am afraid he will throw this up at us for a long time unless we do a little for him.

Mr. Ellis said that Mr. Pizzini was not satisfied and his expectations had fallen down as to the number of gear the Waugh Equipment Company should have been awarded out of the total number purchased by the road at that time and that he might have repeated that to his friend, Mr. Pierpont, vice-president of traffic of the Milwaukee.

Having testified that he did not follow the details closely and had not discussed the subject at all with some roads that had bought Waugh gear, saying that some roads had been sufficiently alive to investigate the improvements in the gear on their own initiative, he was asked to name the roads purchasing gear independently of any remarks made by him, and he named the Santa Fe and the Illinois Central.

He was then asked about the situation on the St. Louis-San Francisco, in connection with which the correspondence had previously been introduced in the records, including a letter from J. R. Koontz, vice-president of traffic of that road, to B. T. Wood, vice-president of purchasing, dated October 18, 1927, in which Mr. Koontz said in part:

> As our envoy extraordinary in connection with Armour & Company's business, thought possibly you might keep this information in store and the next time you see Mr. Ellis use it to advantage.

Mr. Ellis remembered having talked about Armour & Co. business out of Kansas City with Mr. Wood about the subject of the foregoing letter and testified that he would not be surprised if "we probably found we were not doing as much for the Frisco as we could" and that he might have left Mr. Wood with the feeling that he had not been appealed to in vain. He then testified that, where the service between competing roads was the same and other things are equal, he considered it a good policy to favor those roads that purchased Armour & Co. products, but added that this did not apply to the draft gear, in which Armour & Co. was not interested.

He said he talked with G. H. Ingalls, vice-president of traffic of the New York Central, regarding the draft gear situation on the New York Central and also talked with C. J. Brister, vice-president of traffic, to whom he "tried to make it plain that there didn't seem to be any way for the Waugh people to do business with the New York Central", adding that he received such information from Mr. Pizzini. When asked if he had made it plain to J. J. Bernet, president of the Chesapeake & Ohio, that no increase of Armour & Co. traffic would result from the purchase of gear by his road, the reply was that he did not have to, explaining that Mr. Bernet was too keen a man to misunderstand him.

(The report of the final hearings will be published in the next issue.—EDITOR.)

OF THE MORE IMPORTANT PORTS IN YUGOSLAVIA, only Susak, Sebenico and Split have, up to now, been connected with the hinterland of Yugoslavia by means of normal gage (4 ft., 8½ in.) railways. The ports of Metkovic, Dubrovnik and Cattaro have only narrow gage rail connections. Though ideal rail and other developments have not yet been reached in these latter ports, traffic conditions since 1918 have been improved very considerably. Since then, 1,316 kilometers (817 miles) of railway have been added, 314 kilometers are under construction, and almost 2,000 kilometers have been planned and soon will be under construction, Commerce Department reports state.

Looking Backward . . .

Fifty Years Ago

The Green Bay & Minnesota [now the Green Bay & Western] was sold under foreclosure at Milwaukee, Wis., on January 21 and bought by a representative of the bondholders for $2,000,000. The total bonded debt is $5,585,350 and unpaid interest, $1,340,090. The road extends between Green Bay, Wis., and Marshland, near the Mississippi river, about 210 miles.—*Railroad Gazette*, January 28, 1881.

The raid of the legislators on sleeping car companies has broken out with renewed vigor. In Illinois bills have been introduced fixing the rate for a lower berth for one night at $1.50; for an upper berth at $1, and for a section at $2.50. In Indiana a bill proposes to go still further and limit the rate for sleeping accommodations to one-half cent per mile.—*Railway Age*, February 3, 1881.

The Chicago, Milwaukee & St. Paul has announced that it will proceed immediately with the construction of a new route across Iowa, between Chicago and the Missouri river, by the extension of its existing line from its present terminus at Cedar Rapids, Iowa, to Council Bluffs, about 270 miles. The proposed line will lie nearly midway between the Chicago & North Western and the Chicago, Rock Island & Pacific. It is also proposed to build a branch from this new line, 60 or 70 miles long, to Sioux City, Iowa, to connect with the company's extensive system in Dakota.—*Railway Age*, February 3, 1881.

Twenty-Five Years Ago

The Illinois, Iowa & Minnesota [now part of the Chicago, Milwaukee, St. Paul & Pacific], the new outer belt line for Chicago, extending from Momence, Ill., on the south, through Peotone, Joliet, Aurora, De Kalb and Kirkland to Rockford, on the north, a distance of 125 miles, was opened for complete freight and passenger traffic on January 16. Construction of the road was begun in July, 1904, and track laying was completed in December, 1905.—*Railway Age*, February 2, 1906.

The salient fact about the progress in block signaling which has been made in the United States in the past year is that about 50 per cent more automatic block signals have been installed than were installed in the preceding year. The increase in 1905 over 1904 was 1,083 miles of road signaled; in 1904 over 1903 it was 725 miles. These figures have an added significance because a considerable mileage of the new automatic signaling takes the place of manual signals.—*Railroad Gazette*, February 2, 1906.

Ten Years Ago

W. H. Burns, general auditor of the Chicago, Rock Island & Pacific, has been placed in charge of the accounting department.—*Railway Age*, January 28, 1921.

In order to have placed their net operating income on an annual basis of 6 per cent on their valuation, the railways should have earned a total of $321,000,000 in September, October and November, 1920. The net operating income actually earned in those months was $219,507,000, or but 67 per cent of the return expected. At this rate the railways would earn only 4 per cent annually on their valuation, instead of 6 per cent, and these were months of large business. Their freight traffic has declined 30 per cent since October, and on January 1, instead of a large shortage of cars, such as had prevailed so long, they had a net surplus of 257,000 cars.—*Railway Age*, January 28, 1921.

New Books . . .

Books and Articles of Special Interest to Railroaders

(Compiled by Elizabeth Cullen, Reference Librarian, Bureau of Railway Economics, Washington, D. C.)

Books and Pamphlets

A Bibliography of the History of Agriculture in the United States, by Everett E. Edwards. See especially the sections "Colonization and Settlement in America," "Land policies and the public domain" (with index under "Land grants"), "Transportation and markets" (with index under "Railroads"), "Federal, regional, and State projects designed to aid agriculture" (Boulder Dam, Flood control, Inland waterways, etc.), and "Farmers and political activity since the American Revolution." 4273 titles, with table of contents and index. Issued as Miscellaneous Publication No. 84, U. S. Department of Agriculture. 307 p. Pub. by U. S. Govt. Print. Off., Washington, D. C. 45 cents.

Commerce Yearbook 1930. Vol. II—Foreign Countries, compiled by U. S. Bureau of Foreign and Domestic Commerce. Includes discussion of transportation under each country, while the comparative world statistics on transportation and communication (p.657-671) contain tables of operating statistics by countries for 1928. Length of line, freight and passengers carried, 1913 and 1928, freight ton-miles, and gross receipts are given as available. 701 p. Maps. Pub. by U. S. Govt. Print. Off., Washington, D. C., $1.00.

Text of the 43d Annual Report on the Statistics of Railways in the United States for the Year Ended December 31, 1929, prepared by the Bureau of Statistics, Interstate Commerce Commission. Division I, p. ix-xxiii reviews statistical results for the year (a newcomer among the charts being no. V "Tons of freight originating by groups of commodities, 1923-1929" p. xviii). Division II consists of summary statements and includes the map of regions and districts. Some figures of electric railway, pipe line and water carriers reporting to the Commission are included. cxii p. Pub. by U. S. Govt. Print. Off., Washington, D. C. 20 cents.

Periodical Articles

Canada Drives Back the Last Frontier, by Russell Owen. "With airplanes and steel rails . . . " Map and illustrations. New York Times Magazine, January 25, 1931, p.4-5.

Electrification of a Portion of the Orleans Company's System, by Parodi. A comprehensive article accompanied by maps, charts, and graphs describing the problems that had to be met. Bulletin of the International Railway Congress Association, January 1931, p.1-33.

The Elastic Hollow Railway Sleeper, by Scheibe. Experimental tests of this type of tie have been made in Germany. Bulletin of the International Railway Congress Association, January 1931, p.37-41.

This Incredible Modern Travel—A Story of the Newest Comforts. "There are four major desirables in transportation—speed, safety, comfort, and economy. Men generally stress the first two, with due attention to the last when Wall Street has been unkind. Women are insatiable about the third—give them a pillow, they ask for a chaise lounge. . . . Last year's luxuries are this year's necessities—taken for granted rather than talked about. . . Never have so many things been invented with an eye on the lady of the house." The article goes on to describe the passenger train service west of the Mississippi in the United States, in England, on the European continent, in Canada, India, and Japan, as well as steamship and combinations of steamship-rail-air round the world or anywhere, with names of trains, hints as to relative expense, etc. Vogue, January 15, 1931, p. 65, 90-94.

Transportation: River, Rail and Road—The Proper Place of Each. An editorial consideration of some important phases of the current transportation problem. Commercial and Financial Chronicle, January 17, 1931, p. 367-368.

Odds and Ends . . .

A Soviet-American Division

A group of 150 enginemen, yardmasters, switchmen and signalmen are leaving New York for Moscow next month. They will take over one of the divisions of the Trans-Siberian railway and operate it as a sort of a school, where local railway workers may go to be taught American railway practice.

Robert E. Lee—Railroader

It is a little known fact that from August 30, 1870, until his death several months later, General Robert E. Lee, commander-in-chief of the Confederate armies during the Civil war, was president of the Valley Railroad of Virginia. This line now forms a part of the Baltimore & Ohio between Harper's Ferry, W. Va., and Lexington, Va.

A Gusher

Oil has been struck on the property of the St. Louis-San Francisco at Oklahoma City, Okla. The well is probably the largest in the country on railway property. It came in at a depth of 6,420 ft., and has an estimated daily capacity of 40,000 bbl. of oil and 43,000,000 cu. ft. of gas. Another well is now in the process of being drilled.

Clerk-Pastor

Charles W. Campbell, yard clerk for the Pennsylvania at Altoona, Pa., is not only an ordained minister, but is pastor of a church recently dedicated that is without any indebtedness. Rev. Campbell studied for the Methodist ministry after hours and still works at the yard office regularly.

The New Haven Baby

NEW YORK.

TO THE EDITOR:

I have noted that it is a matter of frequent occurrence to name babies born on trains in accordance with the initials of the railroad on which they arrive. What is your choice for a name to be given to the girl baby recently born on a train on the N. Y. N. H. & H.?

S. BROOK.

The "Earth" Moves

The town of Earth, in Lamb County, Texas, made efforts to have the new Texas & Pacific railroad line built into its city, but when these efforts failed, the citizens of Earth held a meeting and decided to pick up their belongings, including their houses, and move the whole Earth five miles away to a point on the new railroad, thus emulating Mohammed and his mountain.

Railway Barristers

Employees of the Louisville & Nashville seem to be quite legally minded. No less than seven of them passed the Kentucky Bar examination in one class recently. They were, Robert A. Simon, secretary to the assistant to the vice-president; R. W. Henriott. rate clerk; Harry H. Simon, stenographer; Ralph E. Cox, ticket clerk; Sylvester F. Ellert, assistant claim agent; Clarence Raymond, chief law clerk; and C. E. Rice, Jr., claim agent.

The Papal Train

The new papal train of Pius XI is reported to exceed in magnificence any other train in the world. It will consist of a number of cars, one for the papal throne, another containing a small chapel, and a third a combination diner and sleeper for the personal use of the Pontiff. There will be several other coaches for members of the Pope's household, for Swiss guards, papal gendarmes, or noble guards. The cars will be of steel, painted dark red. Each one will carry the pontifical coat-of-arms in bronze. The walls will be ornamented with red damask. The decorations on the ceiling will be of gold, in the middle of which will be the pontifical-tiara with the keys of St. Peter. The interiors will be decorated by an internationally known Italian artist, and there will be a valuable painting from the Vatican collection above the altar in the chapel car.

Marathon Fireman

Lin Dilks, fireman for the Baltimore & Ohio, at New Castle, Pa., after shoveling a good many tons of coal into the fire box, likes nothing better than to get out on the road and sprint for a hundred miles or so. Recently Dilks decided to break the world's record for one hundred miles, but circumstances beyond his control made that impossible. However, he did pace off a mere sprint of 82 miles in 13 hr. 53 min., thus breaking the world's record for that distance by nearly an hour.

Red Caps Go to College

Among the Red Caps at the Pennsylvania Station, New York, there have been many college graduates, a number of whom have received degrees in law and medicine, and at the present time there are numerous students among them studying for careers at the various schools and universities. During the past year, three of their force became professional men, one a lawyer, and two physicians. The lawyer is G. G. Jefferson and the doctors are G. H. Price and C. H. Dolly. Thirteen Red Caps at this station are now students in the various schools and colleges.

Fifty-Year Men

The Illinois Central ranks high in the list of railroads with 50-year men in service, having 11 active employees with 50 or more years of service to their credit. These veterans are: W. T. Everett, general car foreman, Water Valley, Miss., 56 years; Edward Dobbins, agent at Del Ray, Ill., 51 years; Peter F. Sheehan, agent at South Chicago, 51 years; J. S. Mulconnery, engineer, East St. Louis, Ill., 51 years; W. L. Catchings, tinner, McComb, Miss., 51 years; C. A. Richmond, conductor, Peoria, Ill., 51 years; Thomas J. Russell, foreman, inbound freight house, South Water Street station, Chicago, 50 years; J. H. Enright, section foreman, El Paso, Ill., 51 years; John Shegog waterworks gang helper, Grenada, Miss., 56 years; John Jones track laborer, New Orleans, 56 years; Calvin Bumpus, section laborer, Covington, Tenn., 51 years.

Berth of a Nation Imperiled

Bedroom compartment cars, replacing old-fashioned sleepers, threaten to put the upper-berth snoring champion on the shelf. New traveling boudoirs for tired business boys have all modern conveniences, including liquid soap, cozy reading lamps, chummy drafts and—to face towel kidnapers—hot and cold conscience twinges. There are also numerous little extras, the most amusing being the extra fare. Somehow we harbor an old-fashioned prejudice against the new hall room sleeping car. Modern luxuries creeping into our railroad systems may sap the ruggedness of the Yankee race, which thus far has been able to disrobe in a curtained chicken coop, remove its shoes while teetering on its collar bone, and get into its pyjamas like a democratic majority crashing a republican precinct. The American spirit, which conquered upper berths and Big Berthas, may languish when sleeping cars go kitchenette. While enjoying our modern blessings, let us not underrate the incentive to climb as a stimulus to human advancement.—Chicago Daily News.

NEWS

Fred W. Sargent Doubts Gas Will Replace Coal

C. & N. W. president discusses pipe lines and other competitors of the railways

Gas will not displace coal among industries, according to Fred W. Sargent, president of the Chicago & North Western, who spoke on pipe lines and highway and waterway competition, at a meeting of the Milwaukee Traffic Club, Milwaukee, Wis., on January 21. "Under present rail rates," Mr. Sargent said, "heat units can be transported in the form of coal at a smaller cost by rail than in the form of gas through pipe lines, if the costs stated by standard statistics for piping gas are correct. Under the most optimistic estimate for the cost of gas by pipe lines, as published by the Gas Age Record, coal at present rail rates still has an advantage of at least seven per cent under the cost of gas, so far as transportation charges are concerned. Exhaustive studies also show the bituminous coal on the average can be produced at the mouth of the mine for $1.50 per ton, and that the cost of producing gas at the wells and assembling for distribution is at least $1.70 for an equal amount of heat units. Natural gas will, by mixing with artificial gas, have a limited market in homes where cleanliness and convenience are the controlling considerations. No city would dare to rely on a gas supply hundreds of miles away. The danger of interruption of service is too great. The coal industry is also becoming really progressive, and already, by new methods, promises effective competition even where cleanliness and convenience are of major consideration in the heating of homes and other buildings. I cannot see that gas offers any large threat to the coal tonnage of the railroads. But if it should, it is safe to say that before sacrificing such tonnage, even lower rates will be made to the extent necessary to keep coal in the market.

"Gasoline pipe lines present a more serious threat to rail tonnage. In so far as these pipe lines are or may become common carriers, it is entirely possible that they may be subjected to the same provisions of law that now apply to railroads under that provision which is commonly called the commodities clause. This clause of the Interstate Commerce Act prohibits a railroad from owning or having any interest in goods while in transit, moving in the channels of trade or commerce. Of course, railroads may ship their own goods for their own use, but they are prohibited by law from owning or having any interest in any goods while in transit that are moving in the channels of trade or commerce. It is probably fair to suggest that if such a provision does not apply to common carrier pipe lines, then the same provision should be repealed as to railroads, and if it is, this might have a material effect upon the possibility of avoiding competitive conditions. In any event, the time may come when railroads will be permitted to make rates for various commodities moving in large quantities, based on train load lots instead of carload lots. Railroads are likely to suffer some during the immediate future and will continue to suffer until this transition period with relation to method of handling and the method of making rates is finally adjusted upon a basis that will give the consumers the advantage of the most efficient and lowest possible cost in securing a gasoline supply at points remote from production."

"Primarily, the remedy lies in proper public regulation and supervision of the competing enterprises —not alone to help the railways but to remove a glaring evil of use of public property and public funds for the promotion of private profit."

—New York Times

[The foregoing is the conclusion of an editorial discussing a Times article in which Prof. William Z. Ripley had outlined railway handicaps in the present competitive transport situation.]

Bill Would Extend Inland Waterways Operations

A joint resolution to authorize the Inland Waterways Corporation to extend the operations of the federal barge service to the Ohio river, from which it is barred by the existing statute creating the corporation, was introduced in the Senate on January 27 by Senator Brookhart, of Iowa.

New Chairman Southern Passenger Association

C. B. Rhodes, assistant general passenger agent of the Southern at Birmingham, Ala., has been elected chairman of the Southeastern Passenger Association, headquarters Atlanta, Ga. This chairmanship has been vacant since the resignation of W. H. Howard, since last April.

Water Rate Regulation Advocated by Fulbright

Attorney, prominent in N.I.T. League, would strengthen powers by Shipping Board

Investment of the United States Shipping Board with "some real power" over port-to-port rates of coastwise shipping was advocated by R. C. Fulbright, well-known attorney of Houston, Tex., and Washington, D. C., and prominent in the affairs of the National Industrial Traffic League, in an address before the fourth annual National Conference on Merchant Marine at Washington, D. C., on January 21. Mr. Fulbright stated that the water lines have "experimented long enough with efforts to eliminate undesirable conditions through voluntary actions and have come to the period where governmental authority will have to be invoked before adequate relief can come."

"You may take your choice," he continued, "this port-to-port commerce is either going to be regulated by the United States Shipping Board or it is going to be regulated by the Interstate Commerce Commission. My personal opinion is that the Shipping Board is better equipped by training and experience to cope with the problem."

In general Mr. Fulbright's address drew a parallel between current conditions in the coastwise shipping field and conditions in the railroad field prior to the enactment of the Hepburn amendment to the Interstate Commerce Act in 1906. The Shipping Act of 1916, he said, was designed to serve a purpose similar to that contemplated by the Interstate Commerce Act of 1887 but, he continued, "both laws were lacking in effectual penal provisions and in sufficient definiteness of authority to enable the respective Federal regulatory bodies effectually to prevent rebates, preferences and discriminations, all of which practices operated to break down the stability of rate adjustments and impair the revenues of the carriers."

Mr. Fulbright next pointed out how the Hepburn act, with its larger grant of power to the Interstate Commerce Commission, stabilized railroad rates and called attention to conditions in the intercoastal and coastwise shipping field which "have combined to produce a situation like that which forced the people of this country to demand the Hepburn Act." Particular attention was called to the effect of present conditions on shippers in the interior of the country who

must ship by rail and "know what their rates will be and what it will cost various competitors to reach a given market if rail service has to be employed" but who cannot tell "what competition they have to meet from those who use water service."

In concluding Mr. Fulbright cited the failure of the conference method of rate stabilization and mentioned the agitation by railroads seeking to extend the jurisdiction of the I. C. C. to cover coastwise rates. Feeling, however, that the "problem of regulating water transportation is vastly different from that of regulating rail commerce" the speaker closed with the suggestion, mentioned at the outset, that the problem be solved by a further grant of power to the Shipping Board.

I. C. C. Appropriation

The House of Representatives on January 27 passed the independent offices appropriation bill, carrying appropriations amounting to $9,412,473 for the Interstate Commerce Commission for the fiscal year 1932, without discussion of this item.

Changes in Iowa and Wisconsin Commissions

Charles Webster, a member of the Iowa Board of Railroad Commissioners, has been elected chairman of that body. Philip H. Porter resigned on January 15 as a member of the Railroad Commission of Wisconsin.

Indianapolis Traffic Club

The Indianapolis Traffic Club on January 22 elected the following officers: President H. A. Koch, division freight agent of the Pennsylvania; first vice-president, C. E. Malloy, general superintendent of the Kingan Refrigerator Line; second vice-president, G. A. McNamara; third vice-president, Conor Price; and secretary-treasurer, R. C. Johnston.

Suwanee River Special Wrecked

The southbound Suwanee River Special, train No. 5, of the Southern was derailed on January 24, near Helenwood, Tenn., 215 miles south of Cincinnati, and the engineman, fireman and three passengers were killed. Twenty or more persons were injured. All the cars of the train left the rails while the train was running at full speed on a curve in a cut.

Names for Dining Cars

A dining car of the Chicago, Milwaukee, St. Paul & Pacific, on the Pioneer Limited, has been christened the "Dan Healey" in honor of one of the railroad's first dining car conductors. Mr. Healey was the first dining car conductor of the Pioneer Limited which was placed in service in 1898. He continued as such until a few days prior to his death in September, 1922.

Southern Freight Bureaus Moved To Atlanta

The railroads composing the Southern Freight Association have voted to consolidate the association's tariff bureaus and those at Louisville and Richmond are to be moved to Atlanta, Ga. It is said that 83 officers and employees will move from Louisville and about 50 from Richmond, making a considerable addition to the population of Atlanta. The change will take effect early in March.

Panama Canal Traffic for 1930

The total number of commercial vessels transiting the Panama Canal during 1930 was 5,885, and the total tolls collection was $26,146,024. The number of transits declined 545, or 8.5 per cent, in comparison with the calendar year 1929, while tolls collections decreased $1,446,690, or 5.2 per cent. The month of the greatest traffic in 1930 was January, while September contributed the lowest. The decrease in canal traffic is attributed to the existing world-wide adverse business conditions.

New Industries on the Frisco

New industries to the number of 325, with a capital investment of $9,329,000 were located on the lines of the St. Louis-San Francisco during 1930. While the number of new industries is slightly less than in 1929, the total investment is considerably more. Three industries make up the major portion. They are, the General Mills at Enid, Okla.; the Pittsburgh Plate Glass Company at Henryetta, Okla., and the Newport-Armstrong Company at Pensacola, Fla.

Ask Postponement of Car-Hire Order

The American Railway Association has asked the Interstate Commerce Commission to further postpone for the remainder of this year its order in the rules-for-car-hire case, pending an appeal to the Supreme Court of the United States from a decision rendered on January 14 by the United States district court at Chicago denying an injunction asked by the roads. The commission has from time to time postponed the effective date of the order pending the court proceedings at Chicago.

Washington Passenger Association

The Washington (D. C.) Passenger Association held its thirteenth annual dinner at the Cairo Hotel on Wednesday evening, January 21. The gathering was addressed by Dr. William J. Cooper, United States Commissioner of Education, who suggested that the railroads create as much student travel to Washington as possible. The president of the Association for the ensuing year, elected at this meeting, is H. A. Karr, division passenger agent of the Pennsylvania.

Supreme Court Hears C. & O. Appeal

Arguments were heard by the Supreme Court of the United States on January 26 on the appeal taken by the Chesapeake & Ohio from a decision of the district court for the southern district of West Virginia dismissing its application for an order setting aside the order of the Interstate Commerce Commission in which it authorized the Guyandot & Tug River, a subsidiary of the Norfolk & Western, to build a line from Wharncliffe to Gilbert, W. Va., 10½ miles, while denying an application of the C. & O. for authority to build a line in that territory.

Death Valley Abandonment

The Death Valley Railroad Company, which was incorporated in 1914 to operate between Death Valley Junction, Cal. and Ryan, has applied to the Railroad Commission of California for permission to abandon its 21-mile line, stating that neither public convenience nor necessity requires further operation as traffic ceased entirely when the Pacific Coast Borax Company closed its plant at Ryan three years ago and moved its operations elsewhere.

North Carolina Motor Vehicle Tax Upheld

The North Carolina law, under which motor vehicles operating for hire between termini more than 50 miles apart are required to pay a larger tax than those operating over shorter routes, has been upheld by the United States Supreme Court. The case, entitled Clark V. Maxwell, reached the Supreme Court on appeal from a decision of the North Carolina Supreme court which had held the law to be valid. This finding of the State court is now affirmed.

Frisco Employees Make Public Sentiment

A petition circulated among business and professional men by employees of the St. Louis-San Francisco and asking that legislation be enacted to regulate motor transportation carriers and to require them to pay an adequate amount in license fees or taxes to compensate the state for the use of its highways, was signed by 93,616 business and professional men in the territory of that railroad. Missouri led the list with 42,839 signatures; Oklahoma came next with 16,558; Kansas had 12,945, and Arkansas 9,508.

Fast Freight Service Out of Chicago

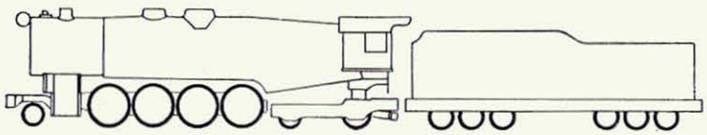
Fast package freight service operated by railroads out of Chicago showed considerable improvement in 1930 as compared with 1929, the per cent of on time freight during 1930 being 95.34 as compared with 92.48 in 1929. Out of 664,153 package cars dispatched in 1930, 633,217 cars reached their destination on time while in 1929 of the 718,671 cars shipped 667,514 arrived on time. In 1930, 24,134 cars or 3.63 per cent were one day late and 6,802 cars or 1.02 per cent were more than one day late. In 1929, 38,592 cars or 5.63 per cent were one day late and 12,565 cars or 1.89 per cent were more than one day late.

Automobiles As Baggage to Colorado

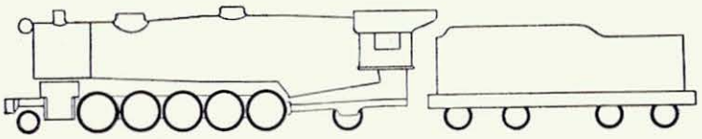
The Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific and the Chicago & North Western have made arrangements whereby patrons may ship their automobiles from Chicago to points in Colorado as baggage by purchasing passenger fares which will permit the transportation of two persons and one automobile. The automobiles will be delivered within 96 hrs. after loading at

Continued on Next Left Hand Page

Why does a Super-Power



EXCEL The Old Style



...In Operating Efficiency?

THE application of Super-Power Principles results in intensified power output. At operating speeds, the 2-8-4 actually produces more power from its four driving axles than can be obtained from the five axles of the old style 2-10-2. Hence the 2-8-4 pulls heavier trains faster, resulting in decreased operating costs.

LIMA LOCOMOTIVE WORKS

Incorporated

LIMA OHIO

LIMA LOCOMOTIVE WORKS INCORPORATED

Chicago. Under the plan, which will be applicable when summer tourist fares become effective; the cost of transporting two passengers and one automobile will be $215 as compared with $581.46 for fares and automobile transportation under present arrangements.

B. & O. To Continue Separate Operation of Alton

The Alton will continue, for the present at least, to be operated as a separate road under control of the Baltimore & Ohio, according to a statement by John J. Cornwell, general counsel for the B. & O., in a recent address before the Association of Commerce of Bloomington, Ill. Mr. Cornwell stated that he did not know how long such an arrangement would continue, but that the plan of separate operation would prevail for a time.

Mr. Cornwell's address was devoted mainly to an interpretation of the "B. & O. spirit" for the Alton patrons among his audience. He did, however, refer to pending consolidation proposals and cited several difficulties which confront the railroads in their attempt to work out a satisfactory plan of consolidation.

I.C.C. To Consider Rates to Meet Truck Competition

The Interstate Commerce Commission has re-opened for further hearing at Dallas, Tex., on February 12, its cotton rate investigation, for testimony on the question whether the finding and order heretofore entered shall be modified, so as to permit carriers to establish and maintain reduced rates on cotton to meet the competition of motor trucks, from points of origin in the Southwest to the Texas ports, without observing the relation required by the order between rates from Oklahoma, Arkansas, Texas and other points to the Texas ports and to New Orleans and Mobile.

The southwestern roads had petitioned the commission for such modifications, stating that improvements in the highways have enabled the truck lines to load 25 to 30 bales per truck, and to maintain regular service for hauls of 300 miles or more.

Government Loans Proposed for New Railroads

An appropriation of $25,000,000 for the purpose of granting loans to aid in the construction of new railroads would be authorized by a bill introduced in Congress by Representative Collins and Senator Stephens, of Mississippi. The bill provides for loans at 5 per cent interest, for periods not exceeding 15 years, with the approval of the Interstate Commerce Commission, for construction of lines approved by certificates of convenience and necessity issued by the Commission. Apparently the prerequisite for such a loan would be a good idea for a railroad accompanied by verified estimates of the cost and negotiated contracts with responsible bidders guaranteeing construction. The bill would require loans sufficient to provide for both construction and equipment and for interest pending the construction period; and for an additional period not exceeding three years after completion and inauguration of service, the interest to be included in the face of the loan applied for.

Frisco Defends Reduced Coach Fares

In support of its proposal to introduce two-cents-a-mile coach fares the St. Louis-San Francisco has filed with the Interstate Commerce Commission a reply to the protest of three other southwestern lines which asked the commission to suspend the tariff. The Frisco asserts that the protest is based "almost wholly on their unsupported and decidedly gloomy forecast of the result which they apprehend will inevitably follow in the wake of the experiment." If the reduced fares will attract additional coach traffic amounting to between 30 and 40 per cent of the traffic formerly hauled, it says, the net revenue will be better than today, and it is not yet "ready to throw up the sponge." "If the experiment is even partially successful, it may indicate the way out for many southwestern carriers whose passenger revenues have been reduced to a point where they now actually threaten the maintenance of an adequate transportation service in the territory." It is pointed out that the only active passenger competition between the Frisco and the Cotton Belt is between St. Louis and Memphis, where the latter, through a subsidiary, is now operating a competitive bus service; and that the Missouri Pacific and Missouri-Kansas-Texas are proposing to meet the reductions proposed by the Frisco between competitive points.

Santa Fe Plans to Enter St. Louis

The Atchison, Topeka & Santa Fe is negotiating with the Chicago, Burlington & Quincy for a joint line between Kansas City, Mo. and St. Louis, according to a statement of W. B. Storey, president of the Santa Fe. "Some fifteen years ago we reached the conclusion that we should go into St. Louis," said Mr. Storey, "and made a tentative agreement with the Burlington for a joint line with it between St. Louis and Kansas City. Before anything could be done, other than the acquisition of some rights-of-way, we became involved in the war, the government took over the roads, and nothing further could be done at that time. After the war the roads came back to their owners with many very difficult problems. . . We have now reopened negotiations with the Burlington and hope to reach a favorable conclusion. . . . Everything is still quite indefinite."

New C. N. R. Board Meets Officers and Employees

Members of the new board of directors of the Canadian National met officers and employees of the System at a gathering which took place at Montreal on January 29, coincident with the first meeting of the new board and of the various employee co-operative committees concerning joint management of shops and maintenance of way. The occasion was a dinner given by the officers of the company to the new directors and representatives of the employees' crafts working under the co-operative management agreement and the general chairman of the unions with whom the railway has agreements. This dinner was Canadian National in all its phases, from the floral decorations produced in C. N. R. greenhouses to the edibles, products of Canada and of the British West Indies and South America, brought to Canada in vessels of Canadian National Steamships.

Rhode Island Plan for New England Railroads

The chambers of commerce of the Rhode Island cities of Providence and Pawtucket have formulated a plan for the allocation of New England railroads to the four trunk lines which would evolve with the adoption of the consolidation plan recently outlined by President Hoover. This Rhode Island plan was discussed by Clemens J. France of the Providence Chamber of Commerce at a recent meeting of the railroad and transportation committees of the Associated Industries of Massachusetts.

The plan in brief suggests the allocation of New England roads in the following manner:

1. New York, New Haven & Hartford to be allocated jointly to Pennsylvania and Baltimore & Ohio.
2. Boston & Albany (from Albany through Springfield to Boston) to be allocated to and integrated with New York Central.
3. Main line of Boston & Maine, from Mechanicville, N. Y., to Boston to be allocated to and integrated with Chesapeake & Ohio-Nickel Plate.
4. Central Vermont (from New London, Conn., to Canadian border) to be allocated to and integrated with Canadian National.
5. That part of Boston & Maine now leased to Canadian Pacific to be allocated to and integrated with Canadian Pacific. (Plan recommends the Canadian Pacific should be given joint traffic rights with other trunk lines over the Boston & Maine to enable the Canadian Pacific to reach on a parity basis, Portland, Boston, Providence and other industrial centres.)
6. Rutland Railroad and New York, Ontario & Western to be allocated to various trunk lines so as to connect New England ports with the foot of Lake Ontario and the head of the St. Lawrence and thus put New England and its gateways to the sea in direct transportation contact with the vast and expanding Great Lakes traffic.

Second Arc-Welding Contest Rules

Details concerning the second Lincoln arc-welding prize competition, which was announced during the latter part of 1930, are now being distributed by the Lincoln Electric Company, Cleveland, Ohio. The competition, the purpose of which is to stimulate designers and engineers in every line of industry to think of the manufacture of their own products by the use of welding and to increase their knowledge of the feasibility of its application, is open to any person, or group of two or more persons, in any country of the world and will close on October 1 of this year.

The subject matter of the papers submitted must come under one of the following headings: (a) A description of a useful machine, structure, or building, previously made in some other way, that has been redesigned in whole or in part, so that arc welding is applied to its manufacture; (b) A description of a machine, structure, or building, not pre-

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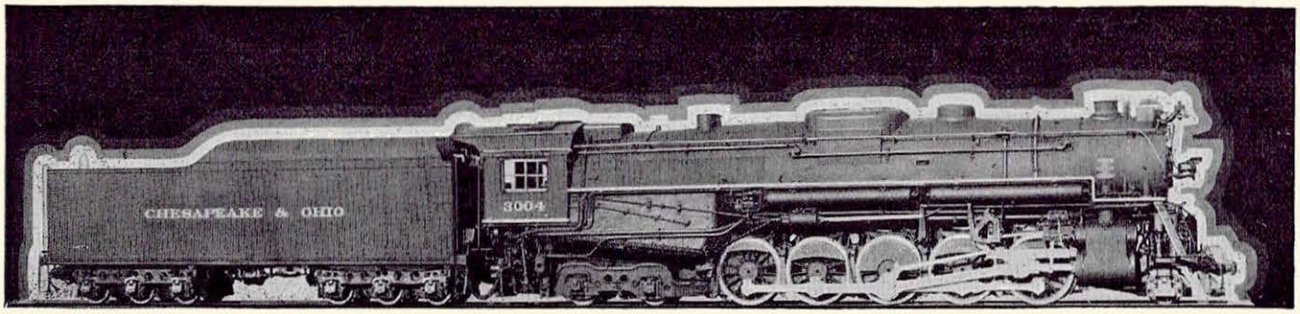
Chesapeake & Ohio 2-10-4 Out-Pulls the Mallet



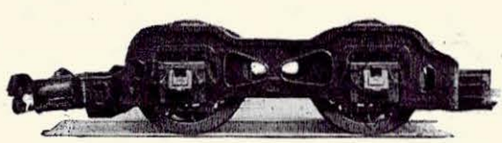
The LOCOMOTIVE BOOSTER *makes this new 2-10-4 the most powerful two-cylinder freight locomotive in the world*

TO the new Chesapeake & Ohio 2-10-4 type locomotives, The Locomotive Booster gives an additional 15,000 lbs. of tractive power, making them the most powerful two cylinder locomotives in the world.

Besides handling heavier loads at higher speeds, these locomotives are intended to reduce maintenance by replacing Mallets.

■ ■ ■

In deciding on the type of new power, remember that The Locomotive Booster supplies the starting power of another pair of drivers. Incorporating it in the new design will save the increased maintenance that would otherwise be involved in the use of another pair of drivers.



This elimination of a pair of drivers saves from 5 to 10 cents per locomotive mile and at a cost of only half a cent per mile for Booster maintenance. Enough to justify the Booster many times over, and to result in a large percentage increase in net income.

FRANKLIN RAILWAY SUPPLY COMPANY, Inc.

NEW YORK CHICAGO SAN FRANCISCO ST. LOUIS MONTREAL

viously made that has been designed in whole or in part to the use of arc welding and a description showing how a useful result is obtained which was impractical by means of other methods of manufacture.

Prizes totaling $17,500 will be awarded by a jury composed of the members of the Electrical Engineering Department of the Ohio State University, under the chairmanship of E. E. Dreese, head of the department, and any outside advice that they shall determine. The first six prizes will range from $7,500 down to $250, and for the seventh to fortieth prize papers $100 each will be awarded.

Summer Railroad Courses at Harvard

Courses in railway transportation are again to be included in the special session for business executives to be held at the Harvard Graduate School of Business Administration during July. These transportation courses, as heretofore, will be given by William J. Cunningham, James J. Hill, Professor of Transportation, Harvard University, and Winthrop M. Daniels, Thomas DeWitt Cuyler, Professor of Transportation, Yale University.

In addition to those in railway transportation, four other courses will be offered as follows: Finance, Public Utility Management, Retail Distribution and Store Management, and Sales Management.

The announcement states that the living and dining halls of the Harvard Business School will be open to those attending the special session and the entire facilities of the library will be available throughout the term.

"Each special session course," it continues, "covers the major part of the work in its particular field offered by the school. The use of actual business cases and problems as a basis for class discussion offers an opportunity for acquiring a broader point of view toward underlying business and economic principles and for an exchange of ideas with other executives on problems of common interest. The session also will make directly available to those attending the results of the business research work being conducted by the school faculty.

"Enrolment in each course is limited to a number which will permit active class room or round table discussions at all times. One hundred and twenty-two companies in 27 states and five foreign countries sent representatives to the special session last year. The average age of the men attending was 35 years."

Want Government to Promote Travel

Representatives of railways, steamship companies, hotels, travel bureaus and other organizations interested in the development of tourist travel attended a conference at Washington on January 22 and 23 called by the International Travel Federation, which was organized about a year ago and which has now held three such conferences. The discussion was devoted to various methods of promoting tourist travel and the possibility of creating a large fund for the purpose, particular attention being paid to the effort to obtain recognition by the United States government of the importance of the travel industry.

On January 23 officers of the organization, including F. H. Turin, president, and C. E. Hatfield, secretary, attended a hearing before the House committee on interstate and foreign commerce in support of the bill introduced by Representative Dyer, of Missouri, which provides for the creation of a travel division in the Bureau of Foreign and Domestic Commerce of the Department of Commerce, to co-operate with existing agencies in the development of travel of foreigners and citizens of the United States in this country and its possessions. W. L. Cooper, director of the Bureau of Foreign and Domestic Commerce, and other representatives of the department also testified in support of the bill, estimating the appropriation necessary to support it at $55,920. The expense would include the salaries of a specialist in charge and other personnel and travel commissioners in Canada and Europe.

Mr. Turin filed with the committee a statement giving a mass of statistics showing the extent and importance of tourist travel and giving an estimate that the travel bill of the world exceeds $7,500,000 annually. He said that recognition by the government in the way indicated by the bill would redound to the benefit of many forms of business.

Oppose Transfer of New York State Barge Canal

Opposition to acceptance by the state of New York of the Federal government's offer to take over the New York State Barge Canal is voiced in recent pronouncements of the New York State Waterways Association and of the Merchants Association of New York. These objections to the transfer are directed mainly at the wording of the Federal government offer which was incorporated into the Rivers and Harbors Act of 1930.

The difficulty, the New York State Waterways Association says, is that the resolution specifically provides that the Federal government never shall without subsequent Congressional authorization deepen the canal beyond its present depth or develop it into a ship canal. The attitude of this organization was incorporated into a resolution adopted by the New York delegates to the National Rivers and Harbors Congress, held recently in Washington, D. C. This resolution took the form of a protest against "any such one-sided contract, contemplating a $200,000,000 gift to the Federal Government under such terms" and calls upon New York legislature "to postpone the second enactment of the Cheney resolution until such time as Congress shall repeal these objectionable limitations." The Cheney resolution, proposing the necessary constitutional amendment to permit New York to effect the transfer of the canal, was passed for the first time by the New York legislature last year; if it pass a second time it will be submitted to the New York voters at the next election.

The Merchant's Association, which supported the original proposal on condition that the transfer "be arranged on terms which would rigidly protect the present and future interests of the people of the State of New York," is now convinced that Congress has made the transfer impossible "except on terms which would be grossly unfair to the State." Objection is also voiced to the Congressional resolution's characterization of the proposed St. Lawrence waterway as "*the* Seaway from the Great Lakes to the Ocean."

Club Meetings

The Car Foremen's Association of St. Louis (Mo.) will hold its next meeting on Tuesday evening, February 3, at the American Annex, Sixth and Market streets. The subject for discussion will be the changes in the interchange rules; speaker J. Mehan (C., M., St. P. & P.) Chicago.

The Canadian Railway Club will hold its next meeting on Monday evening, February 9, at the Windsor Hotel, Montreal. Hon. Duncan Marshall, late Minister of Agriculture of Alberta, will speak on wheat and its relation to Canadian farming.

The Car Foremen's Association of Chicago will hold its next meeting at the Great Northern Hotel on Monday evening, February 9. The discussion will be on the interchange rules.

The Cleveland (Ohio) Railway Club will hold its next meeting on Monday evening, February 9, in the auditorium of the Brotherhood of Railroad Trainmen's Building, West Ninth street and Superior avenue. The discussion will be on the interchange rules. The B. R. T. Building has been chosen as the permanent meeting place, and the date henceforth will be the second Monday of each month.

The Cincinnati (Ohio) Railway Club will hold its next meeting on Tuesday, February 10, at 6 p.m. at the Hotel Gibson. The meeting will take the form of a dinner, with musical entertainment; and J. P. Butterfield, American Rolling Mill Company, will give an address, illustrated by motion pictures, on the continuous mill process.

The Central Railway Club of Buffalo, (N. Y.) will hold its next meeting on Thursday evening, February 12, at Hotel Statler. Robert Faries, assistant chief engineer of the Pennsylvania, will present a paper on the effect of machinery on M. W. organization; and T. H. Carrow, superintendent of safety of the Pennsylvania, will speak on "The Ideal of a Perfect Performance." The Red Arrow Quartet will furnish music.

The Car Foremen's Association of Omaha, etc., will hold its next meeting on Thursday, February 12, at 2 p.m. N. A. Johnson, (C., St. P., M. & O.) will speak on the removal and application of wheels.

The New England Railroad Club will hold its next meeting on Wednesday, February 18, at the Copley Plaza Hotel, Boston, at 6:30 p.m. There will be an address by J. J. Pelley, president of the New York, New Haven & Hartford.

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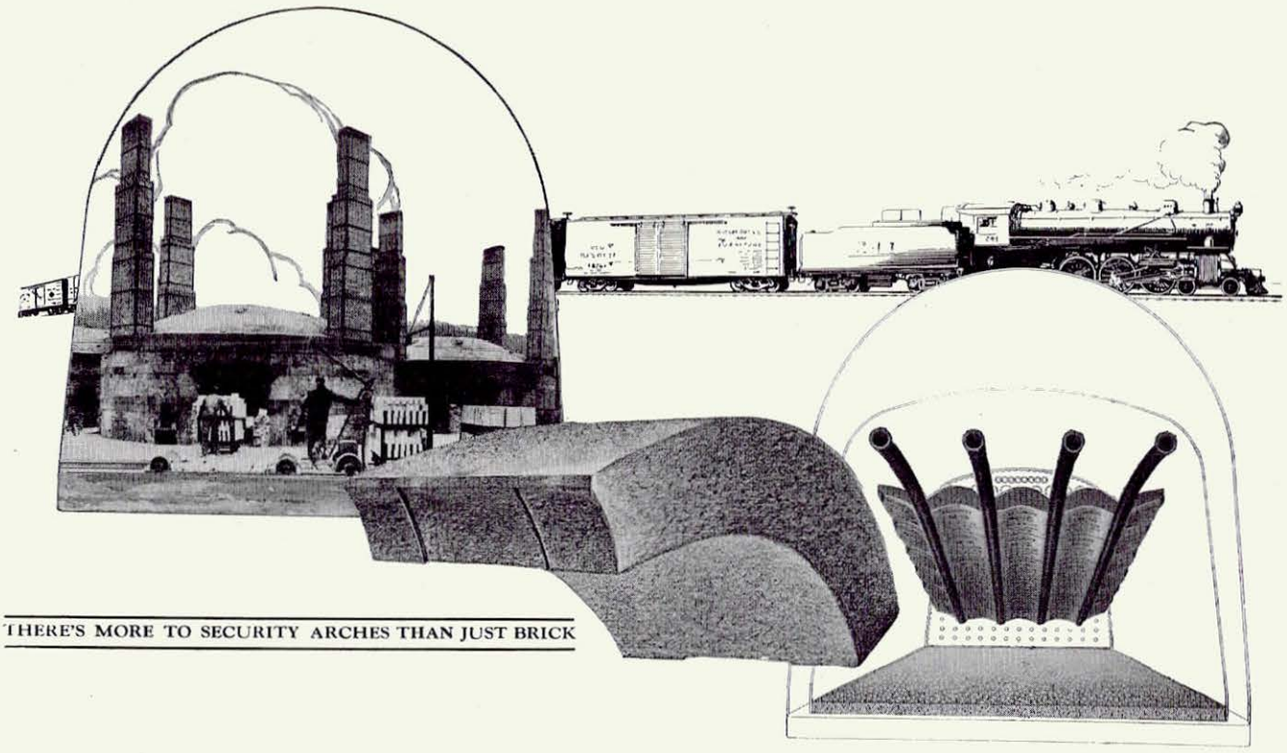


THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK

What Makes Long Arch Life?

GOOD Arch Brick is, of course, a fundamental to long locomotive arch life.

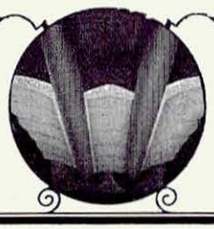
But how this brick is used is equally important. Here enters experience in locomotive combustion.

American Arch Company service gets the arch off to a good start by designing it properly and fitting it to harmonize with the other elements of the locomotive.

Then, after the locomotive is in operation, American Arch Company places at the railroad's disposal a service that will insure getting everything possible out of the Arch Brick.

Only the American Arch Company has the experienced organization to make this possible.

Harbison-Walker Refractories Co.
Refractory Specialists



American Arch Co.
INCORPORATED
Locomotive Combustion
. . . Specialists . . .

Regulation of Competitors Will Not Solve Railway Ills

It is a great mistake to believe that the regulation of the competitors of the railways will solve the problems of the railways, Ralph Budd, president of the Great Northern, stated in an address before the Chamber of Commerce at Des Moines, Iowa, on January 7. The waterways, highways and airways should be so operated and developed as to give the public the benefit of their potentialities, but always with the fact in mind that such traffic as is left to be handled by the railways must bear the burden of operating and maintaining them, Mr. Budd, said.

"With the return of conditions to normal, I cannot but feel that there will be traffic enough to support the railways, especially if their situation is appreciated," Mr. Budd continued. "I suggest that Congress should leave to the Interstate Commerce Commission the regulation of railways, especially as to fixing rates; that railways be permitted to operate ships, motor coaches and trucks in an effort to co-ordinate all forms of public transportation for the sake of improved service efficiency and avoidance of waste. Railways should be encouraged to reduce expenses in every conceivable way, including the making of appropriate consolidations.

"An analysis of the 1930 decline in revenue on the railways as a whole, by commodities, will not be possible for several weeks, but from advance data for the Great Northern, the decline on that road, compared with 1929, is about as follows:

"Revenue from products of mines declined 21 per cent; from manufactures, 16 per cent; from products of forests, 25 per cent; from products of agriculture, 8 per cent, and from livestock and livestock products, 10 per cent

"These five sources account for 91 per cent of the total freight revenue which, as a whole, declined 15 per cent; but less than carload shipments, from which 9 per cent of the total freight revenue is received, declined 18 per cent. Passenger traffic on the Great Northern in 1930 was about 20 per cent less than it was in 1929, while for the railways of the United States as a whole the decline was only 14 per cent. The decline was progressively greater during the year, the greatest percentage decline occuring in December.

"One thing that stands out in such circumstances as the railways have encountered in 1930 is the importance of permitting them to make more adequate earnings in normal times and to retain and accumulate the net available from those earnings against the lean years which occasionally occur. The impression has become more or less current that the railways expect their competitors to be eliminated by legislative action so that the railways may live and prosper. I feel certain that this is an entirely erroneous impression. Railway executives know that transportation by water, by highway, by pipe line and by air will continue and should develop, each in its economic sphere, as a matter of normal progress. Regulation is necessary for the railways themselves and it is likewise necessary for other public transportation agencies; indeed, all public utilities require regulation in order to survive the vicissitudes of excessive and uncontrolled competition. A most important thing in this connection is the fact that proper regulation will tend to strengthen rather than weaken the common carrier highway transportation industry.

* * * *

The Locomotive Assembly Floor in Building No. 10 of the Erie, Pa., Plant of the General Electric Company

Extending so far back that they cannot be easily distinguished, the photograph shows, from front to back, two New York Central electric locomotives for freight service; seven New York Central three-power (oil-engine, battery, third rail) switching locomotives; a 300-hp. oil-electric unit for stock; an 835-hp. oil-electric locomotive for the Erie, and six more New York Central electric freight units. In the near end of the long assembly floor, but, except for the top of one, not showing in the photograph, are several industrial locomotives, mostly for use in South America. The power shown is sufficient to haul, on level track, a loaded freight train 30 miles long, or to haul 30 one-mile trains of 132 loaded 40-ton freight cars each. The 17 locomotives pictured in various stages of assembly have a combined weight of 2,160 tons, and total nearly 33,000 hp.

Foreign

Bus Services Expanding in China

Development of motor bus transportation in China during the past decade has been comparatively rapid despite a lack of adequate roads and the widespread depredations of military conflicts and internal strife, according to recent reports received by the U. S. Department of Commerce. At the end of 1929 a total of 6,410 busses were in operation, having risen from 632 in 1925, 1,016 in 1926, 2,501 in 1927, and 4,149 in 1928. The number of motor bus companies operating in China at the present time is impossible to estimate. However, a list of companies in operation prior to the 1930 military struggles in Central and North China indicates that upwards of 267 private bus companies and several provincial bus services were operating over an aggregate of 20,000 miles of highways.

Southern of Great Britain Plans Port Improvements

The largest drydock in the world is to be constructed at Southampton, England, by the Southern of Great Britain, according to a recent announcement by that company, which will build the dock with government assistance. Designed to accommodate the new 70,000-ton liner now under construction by the Cunard Line, the dock will be 1,200 ft. long, 135 ft. wide and 45 ft. deep.

With the first part of its Southampton docks extension scheme nearly completed, at a cost of about $15,000,000, the railway company also plans to start work immediately on the second stage of the project, which involves the reclamation of about 200 acres of mud land for industrial sites close to deep-water berths. The two developments, both to be completed about 1933, will cost approximately $65,000,000, and will ensure the maintenance of Southampton's place among the world's most efficient ports.

Wooden Train Staff Up To Date

The electric train staff, adapting itself to all modern conditions, is fitted to provide, in hours or days of dull business, for two or more block sections to be combined into a single long section. The modification of the machinery for the purpose of complying with this condition is a matter of considerable complication and cost. On the London & North Eastern of Great Britain it appears that this adjustment of facilities to light traffic is carried out also with the old-fashioned wooden train staff. A fundamental difference between the wooden train staff and its modern successor, the electric staff (or tablet), is that with the older system there is but a single staff for each block section.

The line of the London & North Eastern between St. Margaret's and Buntingford, single track, is about 13 miles long and there are two intermediate stations. Beginning at St. Margaret's, the first section has a round staff and the

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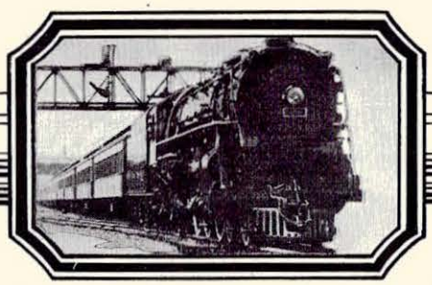

ALCO ALCO

To-morrow's Profits

STANDARD STATISTICS referring to one of the large systems, states:

"Operating expenses were again closely controlled in November. Maintenance ratio for the month was reduced to 30.4 per cent as against 34.8 per cent a year ago. The fact that net income for the 11-month period ended with November, after all charges and sinking fund appropriations, declined only 5.2 per cent in comparison with corresponding 1929 period, is largely attributable to increased efficiency and more economical operation. Heavy expenditures for improved facilities and new equipment in recent years have permitted sharp reductions in maintenance outlay without impairment of normal physical condition."

As a rule, the Railways making the best showing today are those having the greatest proportion of modern power.

Modern locomotives bought today are an investment in tomorrow's profits regardless of the then existing business conditions.

American Locomotive Company
30 Church Street New York N.Y.

ALCO ALCO

next a square one; and on the third it is triangular. Starting from Buntingford (on the last trip before converting the line into a single section) the guard takes the staff for that section and puts it into a metal container. On arriving at the next station he gets the square staff and puts this into the container and backlocks the first one; at the next station he gets the round staff and puts that also into the container; and on arrival at St. Margaret's, a key on the container, after locking the three staffs in, is used to procure the staff for the whole 13-mile section. It is said that the arrangement has been found simple, safe and effective. The use of tickets to allow of sending two or more trains on a single staff is not provided for under the arrangement for a single 13-mile block.

Highway Transport Discussions in Great Britain

That the problem of allocating the cost of highway construction and maintenance equitably among the users of these facilities, is as pertinent a one in Great Britain as in this country, is indicated in a recent letter to the editor of Modern Transport (London). This communication, written by J. G. H. Warren, is reproduced below.

It is published herewith because it indicates that problems of this nature confronting Great Britain have certain similarities with current American problems and that at the same time there are certain differences, as may be gleaned from Mr. Warren's discussion.

WHAT IS THE REAL COST OF ROAD TRANSPORT?

In reply to another correspondent you say that "road transport has proved invaluable to every trade and industry." It may superficially appear so (though you appear to ignore the railways); but, unfortunately, the true costs by road cannot be accounted to the job, and if all the facts are considered it may be that we have, as a nation, today the most costly transport in the civilized world. The subject calls for an investigation by a first-class economist, though he would possibly not live long enough to complete it. Meanwhile, consider the following facts:—

1. In 10 years we have spent £545,000,000 on roads, and during the next five years will spend a further £50,000,000; making £595,000,000 in 15 years, on which interest must be earned if it is to be economic.
2. In 100 years, up to 1925, our railways had cost £1,190,500,000, approximately only double the cost of the roads in 15 years.
3. An enormous volume of heavy traffic has been diverted from those railways to, and will remain on, the roads.
4. As a result, railway capital values have been largely destroyed.
5. We have now invested a vastly greater total capital than we had 20 years ago to carry a reduced total national traffic in essentials.
6. The resistance to traction on a road is probably from 5 to 10 times greater than on a railway, so that the power required per ton-mile is also greater.
7. The power required for the larger part of our road transport is obtained from imported fuel, while our national fuel—coal—becomes increasingly unsaleable.
8. Road traffic has caused much depreciation in certain property values; it has however, appreciated others and this item may cancel out.

Road traffic has also caused an enormous destruction of life. It is also destroying much of cultural value. In this city of Bath, buildings of peculiar historic and local value are being scheduled for destruction, and whole street frontages are threatened, to accommodate a monstrous traffic which should never have been permitted on the roads. And consider Oxford! These cultural values are, however, the *imponderabilia* of life, and I do not include them in my contra-account, which I will confine to material and calculable values under the items given above.

In all the circumstances, can we say definitely that heavy road transport as a whole is economic? It has given great convenience in many cases of supply, because of its greater flexibility; but this is obtained largely at the cost of life and property. Things have come to a pretty pass when one ought to insure one's house against damage from impact by road vehicle! In the matter of passenger transport, especially in dense urban or sparse rural districts, it has proved of maximum convenience and value. On the other hand, a great volume of passenger road traffic has no economic value, but is a luxury which has grown to enormous proportions at a time when the country can ill afford it. The motor-car to-day has probably done much to increase the cost of family living, on account of the extravagances to which it has led.

A man can go 40 miles to lunch "in a 'Bentley,' of course," and be back at his office for work; the bright young people can, and do, go 100 miles to a dance—but can anyone show me that my pound of flour, or pint of milk, is any cheaper to-day because it is delivered by motor vehicle? And though we can get heavy goods, or coal, cheaper by road, what is the net profit if railway dividends vanish and rating for road purposes increase?

Now, what must be the conclusion of this state of affairs if there is to be any return on the immense capital now sunk in national transport systems? It must be just that control and combination which you fear will result from the new Act. The fundamentals are the same as they were in 1846, when a Select Committee on Railways reported as follows:—

Economy in the outlay of capital and in the application of the surface of the country to its railways ought always to be aimed at . . .

Mr. Robert Stephenson, when asked whether the lowering of fares might not be influenced by competing lines and competing canals, gave this decided answer:—

I have had so many cases of that kind brought before me that I have come to the conclusion that, wherever combination is practicable, competition is impracticable. Therefore I say, let the Government be as stringent as they like with existing companies, but never excite competition; because, by exciting competition, you increase the capital invested for giving the same convenience which would be otherwise obtained with less capital.

This letter does not attempt to deal with the causes for the present state of affairs. They are the *sequelae* of the War—principally high costs of railway transport due to inflated wages under Government control, and making work for the unemployed. What I challenge is the common belief that we have got cheap national transport as the result to-day.

Modern Transport certainly have given us your bright pages every week—will you not add to their impartiality and interest by instituting a scientific inquiry into the question raised in this letter?

Equipment and Supplies

LOCOMOTIVES

THE LOUISIANA & ARKANSAS is inquiring for two or three locomotives of the 2-10-4 type.

FREIGHT CARS

THE SOLVAY PROCESS COMPANY is inquiring for from one to six insulated tank cars of 10,000 gal. capacity.

THE FORD MOTOR COMPANY is asking for prices on 50, 100 or 150 gondola cars of 70 tons' capacity for handling billets.

MISCELLANEOUS

THE LOCOMOTIVE FIREBOX COMPANY has received orders for syphons from foreign railways as follows:

For 7 locomotives of the 4-6-2 type for the Peking-Mukden, China
For 3 extra boilers for the Kiachow-Tsinan, China
For 3 locomotives of the 4-6-0 type for the German State Railways
For 3 locomotives of the 4-6-2 type for the Northwestern, India
For 10 locomotives of the Garratt type for the Rio Grande do Sul, Brazil
For 1 locomotive of the Mikado type for the Belgian-Congo, Africa

Supply Trade

G. H. Waite, representative of the **American Steel & Wire Co.** with headquarters at Kansas City, Mo., has been promoted to manager of sales with the same headquarters.

C. B. Murphy, special representative of the Diesel Engine division of **Fairbanks Morse & Co.** at Washington, D. C., has been appointed manager of stationary Diesel engine sales at Chicago.

J. C. Keene, special representative, Bradford Corporation, has also been appointed manager of railway sales, midwest district, **Durametallic Corporation,** with offices in the Pure Oil building, 35 E. Wacker drive, Chicago.

B. B. Brewster, inter-mountain manager of the **Sullivan Machinery Company** with headquarters at Salt Lake City, Utah, has been appointed manager of the territory in Illinois, Indiana and Kentucky with headquarters at St. Louis, Mo., and Mt. Vernon, Ill., and is succeeded by **O. S. Neslage,** manager at Mexico City, D. F.

A. E. Ballin, president and a director of the **McIntosh & Seymour Corporation,** Auburn, N. Y., a division of the American Locomotive Company, has retired and it is expected that **R. B. McColl,** manager of the Schenectady plant of the American Locomotive Company, will be elected president and a director of the McIntosh & Seymour Corporation to succeed Mr. Ballin. **R. P. Allison,** manager of the Dunkirk, N. Y., plant of the American Locomotive Company, will be manager of the Schenectady plant to succeed Mr. McColl and **John S. Stevenson,** in charge of general development work of the American Car & Foundry Company at New York, will be manager of the Dunkirk plant, with headquarters at Dunkirk, to succeed Mr. Allison.

Robert Lee Wilson, assistant to the president of the **Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., has resigned. Mr. Wilson entered the service of the Westinghouse Company in 1894 after graduating from the Rose Polytechnic Institute and spending a year in Johns Hopkins University in post graduate work. Starting in as an apprentice, Mr. Wilson filled many positions in the Westinghouse organization. While district engineer with headquarters in New York he superintended the original electrification of the Manhattan Elevated and the New York subway. From 1906 to 1909, as superintendent of railway construction, he handled the construction and installation of equipment for the electrification of the New York, New Haven & Hartford and the St. Clair Tunnel of the Grand Trunk. While Mr. Wilson will devote himself mainly to his private affairs, he will be retained by the Westinghouse Company as a consultant.

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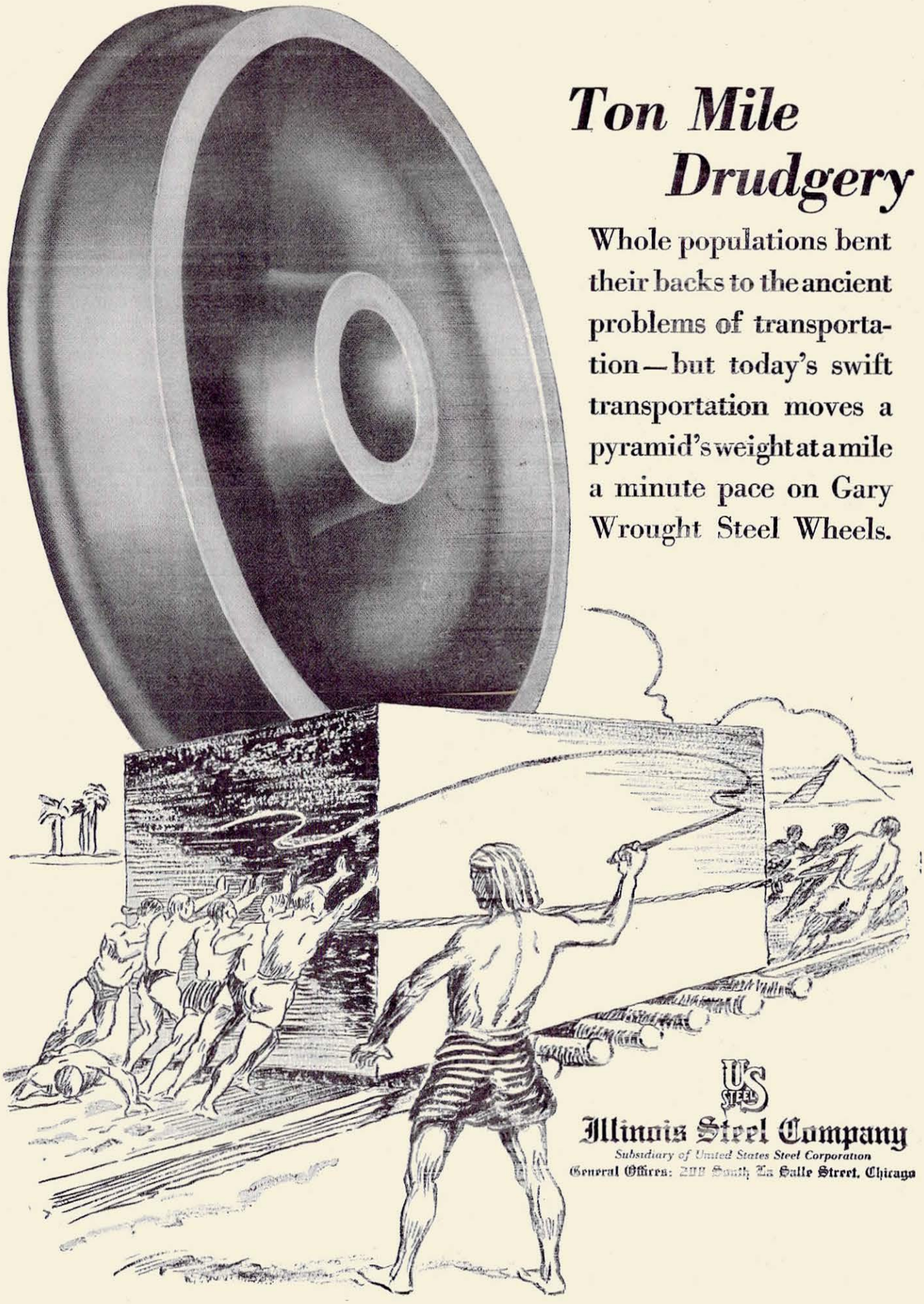

Ton Mile Drudgery

Whole populations bent their backs to the ancient problems of transportation—but today's swift transportation moves a pyramid's weight at a mile a minute pace on Gary Wrought Steel Wheels.

U S STEEL

Illinois Steel Company

Subsidiary of United States Steel Corporation

General Offices: 208 South La Salle Street, Chicago

Financial

BALTIMORE & OHIO.—*Asks Authority to Acquire Alton.*—The Baltimore & Ohio has applied to the Interstate Commerce Commission for authority to acquire control of the properties formerly comprising the Chicago & Alton system, which were sold at foreclosure on December 11, by acquiring all but directors' shares of an issue of $25,000,000 of common stock of the Alton Railroad Company, a new company organized to take over the properties from Douglas M. Moffat and Colin C. Ives, who had bid in the property at the sale as agents for the B. & O. Concurrently the Alton company filed its application for authority to acquire and operate the property, to assume obligation and liability in respect of $45,350,000 of 3 per cent refunding bonds and other liabilities, and to issue $25,000,000 of stock. The B. & O. application pointed out that the acquisition will place the Alton properties on a more assured financial basis and will supply in part the necessities of System No. 5 of the commission's consolidation plan at its western end, "whereas at its eastern end your applicant has increased the possibility of meeting its necessities in that territory by an enlarged interest in the Reading, which in turn controls the Central Railroad of New Jersey, all with the consequence of more nearly approaching the realization of a more rounded out and better balanced Baltimore & Ohio system." The application also includes details of an offer to acquire control of "each and every short or weak railroad which the commission considers ought to be continued in operation and included in its proposed system."

CHICAGO, MILWAUKEE & ST. PAUL.—*Bonds.*—The Interstate Commerce Commission has authorized the Chicago, Terre Haute & Southeastern to issue $364,000 of 5 per cent first and refunding mortgage 50-year bonds, to be delivered to the Milwaukee in reimbursement of indebtedness, and the Milwaukee has been authorized to assume obligation and liability for the bonds and to assign them to the trustee under its first and refunding mortgage.

CINCINNATI UNION TERMINAL.—*New Directors Elected.*—G. D. Brooke, vice-president and general manager of the Chesapeake & Ohio, has been elected a member of the board of directors, succeeding W. J. Harahan, senior vice-president of the C. & O., who has resigned. T. E. Brooks, vice-president of the Louisville & Nashville, has been elected a member of the board to succeed G. E. Evans, deceased.

FLORIDA EAST COAST.—*Operation.*—The Interstate Commerce Commission has authorized this company to operate over an 0.6-mile extension of the City of Miami's municipal dock railway, permission to operate over 3 miles of its line having been heretofore granted.

KANSAS & OKLAHOMA.—*Sold.*—This company which operates between State Line, Kan., and Woods, Kan., 19 miles and which was built in 1923, was sold at public auction at Hutchinson on January 24 for $34,000 to C. M. Light, a miller at Liberal. The purchaser also assumed $15,000 in back taxes.

MISSOURI PACIFIC.—*Bonds.*—A group of seven bankers, headed by J. P. Morgan & Co. and Kuhn, Loeb & Co., are offering, subject to authorization by the Interstate Commerce Commission, $61,200,000 of first and refunding mortgage 5 per cent bonds, series I, of this company. The issue will mature in 1981 and is offered at 95 to yield over 5.25 per cent.

NEW YORK CENTRAL.—*Bonds.*—The Interstate Commerce Commission has authorized the sale of a recent issue of $5,000,000 of refunding and improvement mortgage bonds of the Cleveland, Cincinnati, Chicago & St. Louis to J. P. Morgan & Co. at 98, which will make the average annual cost to the railroad approximately 4.6 per cent.

PENNSYLVANIA.—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority to sell to Kuhn, Loeb & Co., a total of $27,321,000 of bonds of subsidiary companies, guaranteed by the Pennsylvania, and issued to it in reimbursement of advances.

PENNSYLVANIA.—*Bonds.*—Kuhn, Loeb & Co. is offering $11,301,000 of general mortgage 4½ per cent, series C bonds of the Philadelphia, Baltimore & Washington, due in 1977, at 102, to yield 4.4 per cent; and $6,483,000 of first and refunding mortgage 4½ per cent, series A bonds of the Pennsylvania, Ohio & Detroit, due in 1977, at 100, to yield 4.5 per cent. Both issues are guaranteed by the Pennsylvania and are subject to approval of the Interstate Commerce Commission.

WESTERN MARYLAND.—*Abandonment.*—The Interstate Commerce Commission has authorized this company to abandon a part of a branch line extending from Gahanhurst, W. Va., southeasterly to Weaver, approximately 3 miles.

WABASH.—*Defers Dividend.*—Directors of this company have deferred action on the quarterly dividend of $1.25 on the preferred A stock and no action was taken on preferred B dividends on which $5 annually has been paid for the past four years.

Average Prices of Stocks and of Bonds

	Jan. 27	Last week	Last year
Average price of 20 representative railway stocks.	94.30	89.61	130.60
Average price of 20 representative railway bonds..	94.52	94.07	92.10

Dividends Declared

Illinois Central.—Common, $1.75, quarterly, payable March 2 to holders of record February 6; Preferred, $3.00, semi-annually, payable March 2 to holders of record February 6.

International Railways of Central America.—Preferred, 1¾ per cent, quarterly, payable January 31 to holders of record January 31.

New Orleans, Texas & Mexico.—$1.75, quarterly, payable February 28 to holders of record February 13.

Norfolk & Western.—Common, $2.50, quarterly, payable March 19 to holders of record February 28.

Reading.—Preferred, $.50, quarterly, payable March 12 to holders of record February 19.

Construction

ATCHISON, TOPEKA & SANTA FE.—The Interstate Commerce Commission has authorized the North Plains & Santa Fe to acquire from the Panhandle & Santa Fe a line extending from Amarillo, Tex., northward 100.5 miles, and to complete the construction of such portion of this line as is not already built.

CANADIAN NATIONAL.—The general contract for the construction of a new freight shed at Fort William, Ont., to replace one destroyed by fire in 1930 has been awarded to B. W. Graham & Sons, Moosejaw, Sask. This structure on pile foundations will have outside dimensions of 900 ft. by 60 ft. and will involve the expenditure of about $150,000.

MISSOURI PACIFIC.—A contract for the foundation work for the construction of a 2,500,000-bu. reinforced concrete grain elevator at Kansas City, Mo., has been awarded to the List & Weatherly Construction Co., Kansas City. It is expected that bids will be requested for the construction of the superstructure of the elevator about March 1.

NEW YORK CENTRAL.—The Public Service Commission of New York has advised this road that it does not consider excessive the bid of $31,922 submitted by H. R. Beebe, Inc., of Utica, N. Y., for work covering the reconstruction of the bridge carrying its tracks over the Trenton-Prospect-Remsen State highway in Trenton, N. Y. The Commission, having previously ordered the reconstruction of the bridge, has now directed the New York Central to award the necessary contract, and begin the work as soon as practicable.

STOCKTON, CALIF.—Examiner Thomas F. Sullivan of the Interstate Commerce Commission, in a proposed report, has recommended that the commission deny an application by the Southern Pacific for authority to construct a terminal line of 3.7 miles to serve the port of Stockton, Calif., but that the Western Pacific and the Atchison, Topeka & Santa Fe, which had filed separate applications for authority to build similar lines, be authorized to construct jointly a line serving the port area and connecting with their lines and tracks owned by the city of Stockton. He also recommends that an application by the city to construct an additional line be denied, but that the Southern Pacific be authorized to join with the Santa Fe and Western Pacific, upon agreement, in the construction of the joint line.

TEXAS & PACIFIC.—A contract for the construction of a highway subway under the tracks of this company at Jennings avenue, Fort Worth, Tex., has been awarded to Butcher & Sweeney, Fort Worth. The total cost of this structure, which will be about $225,000, will be borne by both the railroad and the city of Fort Worth.

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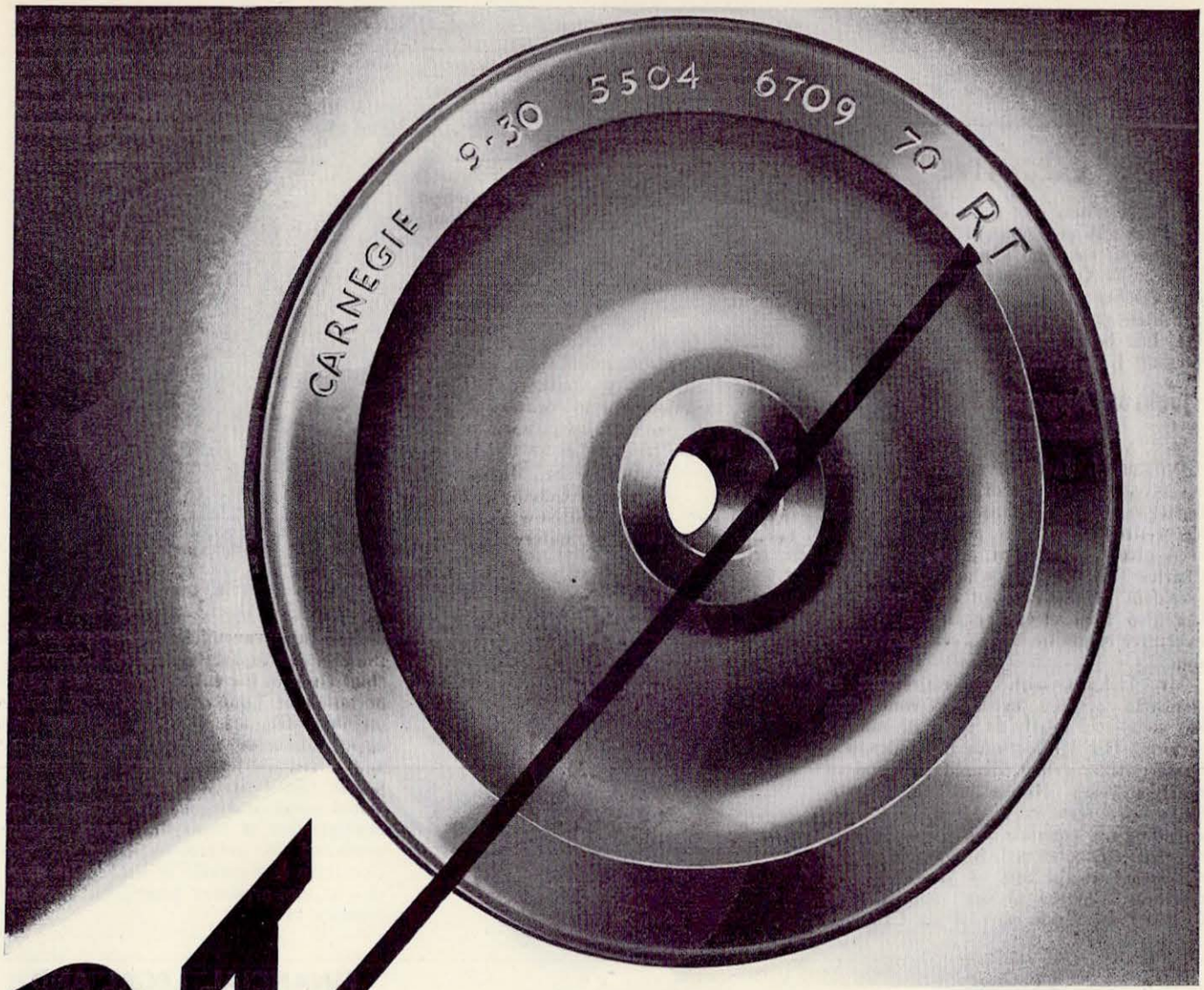

RT . . . the Mark of EXTRA SERVICE

The ever-increasing weight and speed of modern transportation throw a tremendous burden on equipment, particularly on wheels. To meet this condition, we are now prepared to furnish special heat treated wrought steel wheels for passenger, engine truck and locomotive tender service; also heat treated wheels for electric railway service, and single and double flanged crane wheels. The process of heat treatment, varying for different types of service, produces a wheel with an especially tough rim and with high physical properties—a wheel that is highly resistant to wear.

"R T" stamped on your wheels means Rim-Toughened. It indicates the additional refinement of heat treatment. It is the mark of extra service—of extra stamina to endure the heavy loads of present-day transportation.

Our wheel engineers are at your service.

CARNEGIE WROUGHT STEEL WHEELS

Product of Carnegie Steel Company, Pittsburgh, Pa. U.S. STEEL *Subsidiary of United States Steel Corporation* 115

Railway Officers

EXECUTIVE

J. R. Pitcher, vice-president, treasurer and general manager of the Silverton Northern, has been appointed president, succeeding **Otto Mears**, resigned and **C. M. Pitcher** has been appointed vice-president and treasurer. **J. R. Pitcher, III**, has been appointed secretary succeeding **J. B. Frank**, resigned.

Jackson Appointed C. & E. I. President-Retired

William J. Jackson, chairman of the executive committee of the Chicago & Eastern Illinois for the past five years, has retired from that position and has been given the title of president-retired. Charles T. O'Neal, who was elected president of the railroad on January 1, has also been elected chairman of the executive committee to succeed Mr. Jackson.

Mr. Jackson, with his retirement as chairman of the executive committee, has completed nearly 54 years of railway service. His service with the Chicago & Eastern Illinois has covered a period of nearly 40 years. He was born at Toronto, Ont., on December 28, 1859, and after attending the grammar and normal schools of that city obtained his first railroad experience at the age of 17 years as a machinist's helper in the shops of the Grand Trunk (now part of the Canadian

William J. Jackson

National). Later he served on that road and the Chicago & Grand Trunk (now the Grand Trunk Western) as a freight clerk at Toronto, chief claim clerk at Chicago, and general freight foreman and assistant agent at the latter point.

In 1891 Mr. Jackson became assistant local agent on the Chicago & Eastern Illinois at Chicago and from 1893 to 1909 he served that road in turn as local agent, assistant general superintendent, general superintendent and general manager. He was then elected vice-president and general manager and when the C. & E. I. was placed in receivership in 1913 he was appointed its receiver, as well as acting as president of the corporate company. Mr. Jackson served as receiver of the Chicago & Eastern Illinois until its reorganization in 1922, with the exception of the period from July, 1918, to February, 1920, when he was its federal manager under the United States Railroad Administration. In January, 1922, Mr. Jackson was elected president, then becoming chairman of the executive committee in July, 1925.

Gaston C. Hand, who has been succeeded as vice-president and secretary of the Kansas City Southern by **J. J. Weiss**, as announced in *Railway Age* of January 10, page 175, was born at Belmont, N. C., on July 2, 1870. He received his education at St. Mary's College (now Belmont Academy), Philadelphia Law School and New York University. In 1891 he entered railroad

Gaston C. Hand

service with the Atlantic Coast Line as station agent and telegraph operator, serving in that capacity until 1893. From 1893 to 1896 he served as dispatcher's apprentice and train dispatcher, and in 1896 he became chief clerk of the traffic and transportation departments. In 1901, he joined the transportation department of the Pennsylvania. From 1902 to 1904 he was engaged in banking and during the period from 1904 to 1908 he served as statistican of the firm of Ladenburg, Thalmann & Co. From 1908 to 1909, he was connected with the Interstate Commerce Commission as examiner. In 1909 he entered the service of the Kansas City Southern as secretary, and in 1918 was appointed also vice-president of that road and several subsidiary companies.

T. E. Brooks, who has been elected vice-president in charge of operation of the Louisville & Nashville, with headquarters at Louisville, Ky., has been connected with that railroad for nearly 49 years. He was born at Ashley, Ill., on December 4, 1865, and entered railway service in 1882 as a night operator on the L. & N. at that point. Previous to his entry into railway service he studied telegraphy for two years on the Louisville & Nashville. Subsequently he was advanced on that railroad successively through the positions of agent and dispatcher at Ashley, timekeeper and chief clerk to the assistant superin-

T. E. Brooks

tendent at Evansville, Ind., secretary to the division superintendent at Louisville, chief clerk to the superintendent of transportation at Louisville, master of trains on the Memphis division, and general agent, assistant division superintendent and division superintendent at various points. In 1920 Mr. Brooks was promoted to assistant general manager, with headquarters at Louisville, being further promoted to general manager of the Louisville & Nashville in 1923. His election as vice-president became effective on January 16.

FINANCIAL, LEGAL AND ACCOUNTING

Effective February 1, **D. G. Baird**, secretary of the Lehigh Valley, will assume also the position of treasurer, and **A. F. Bayfield**, treasurer, will become comptroller succeeding **J. I. Morrison**, retired. Both will have headquarters at Philadelphia, Pa., as before.

James A. Simpson, assistant treasurer of the Southern Pacific, has been elected treasurer, with headquarters as before at New York, succeeding **George M. Thornton**, who retired from active service on January 16. **E. J. Goodwin**, transfer agent at New York, has been promoted to assistant treasurer, to succeed Mr. Simpson.

Mr. Simpson was born on June 12, 1883, at Bonhill, Scotland, and received his education at Glasgow University. In 1905, he entered railway service with the Union Pacific-Southern Pacific system, which roads were later segregated, and in 1913, he became transfer agent of the Southern Pacific. In 1925, he was advanced to assistant treasurer, the position he held until his recent promotion.

Mr. Thornton had been connected with the Southern Pacific Lines for 37 years. He was born at Newportville, Pa., on May 22, 1863, and gained his first busi-

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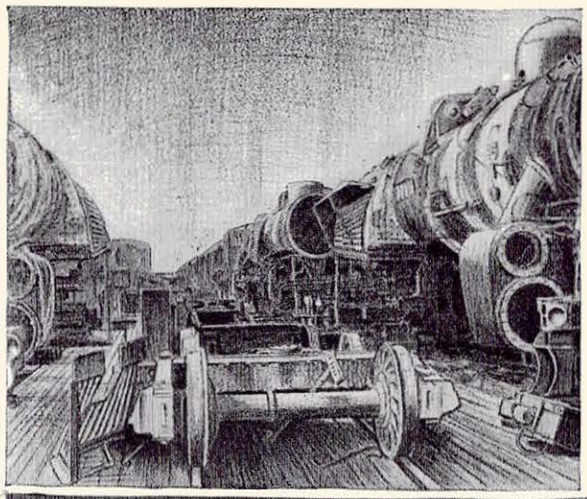

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Mo-lyb-den-um IRON

An Epidemic of Parts Failures Checked by the "Metal Doctor"

SPRINGS on the new equipment were failing with appalling frequency. Designs were checked. Manufacture was looked to. And yet, the failures continued.

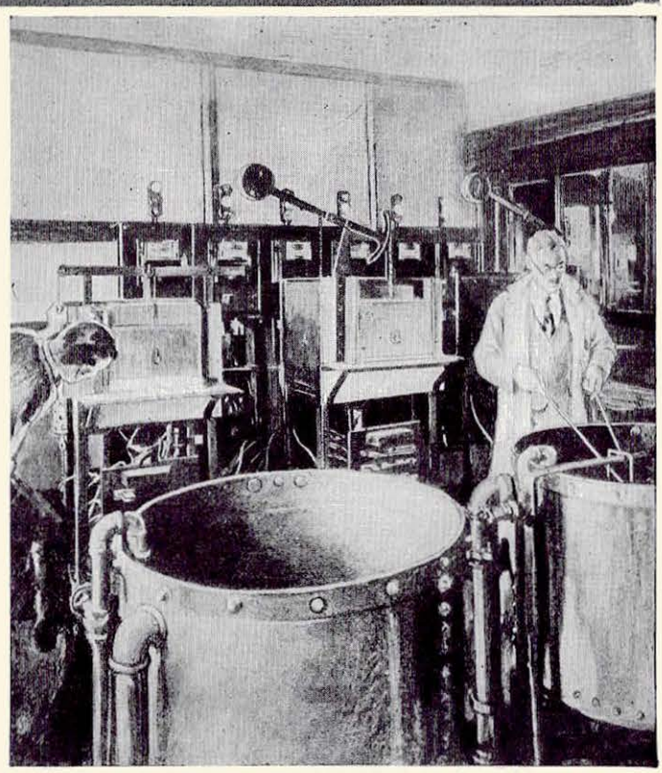
■ Republic metallurgists were appealed to. Conditions were analyzed; metallurgical examinations made, and a special alloy steel was chosen to remedy the trouble.

■ No longer is steel just steel. Alloys have given the metallurgist a multitude of steels with varying qualities with which to meet varying conditions of service.

■ For all these conditions, metallurgists of the Republic Steel Corporation have developed in the country's largest metallurgical research laboratories special alloy steels and irons.

■ These better materials are proving of the greatest assistance in controlling the rising tide of maintenance.

■ Where materials are a problem, consult the Republic Steel Corporation.



Central Alloy Division

REPUBLIC STEEL CORPORATION

Massillon, Ohio

ness experience in the general merchandizing business in 1881. In 1893 he entered railway service in the treasury department of the Southern Pacific, being advanced through various minor positions until 1918 when he was promoted to assistant treasurer at New York. Mr. Thornton was elected treasurer of the Southern Pacific in 1926, and at the time of his retirement he was also treasurer of the Nacozari and assistant treasurer of the Northwestern Pacific, the Southern Pacific of Mexico and the Texas & New Orleans.

Mr. Goodwin was born on October 26, 1888, at Brooklyn, N. Y., and received his education at Polytechnic Institute of Brooklyn. He entered railroad service in September, 1903, with the Union Pacific-Southern Pacific system. When the Union Pacific and the Southern Pacific were segregated, he went with the Southern Pacific and has been in the continuous service of that road to date. In 1917, he became chief clerk of the transfer department. On November 1, 1925, he was appointed transfer agent, which position he will retain in addition to undertaking the newly assigned duties of assistant treasurer.

OPERATING

Albert S. Twombly, superintendent of the Portland division of the Boston & Maine, has been granted a six weeks leave of absence to act as operating advisor of the Consolidated Railroads of Cuba, and **G. W. Blake,** assistant superintendent of the Fitchburg division, has been appointed acting superintendent of the Portland division.

William E. Smith, who has been promoted to general manager of the Louisville & Nashville, with headquarters at Louisville, Ky., has been in the service of that road for nearly 50 years. He was born at Georgetown, Ga., on September

William E. Smith

13, 1868, and obtained his first railway experience as a water boy on the Louisville & Nashville at the age of 12 years. During the following 24 years he was advanced successively through the positions of messenger and assistant agent, section laborer, section foreman, clerk in the roadmaster's office, supervisor of construction, track supervisor and road master. In 1905 Mr. Smith was promoted to assistant division superintendent at Birmingham, Ala., then being appointed superintendent of construction, with headquarters at Louisville, in 1912. He was promoted to division superintendent at Birmingham in 1915 and was further promoted to assistant general manager with headquarters at Louisville, in 1924. His advancement to general manager of the Louisville & Nashville became effective on January 16.

James J. Jordan, who has been promoted to superintendent of the Coast division of the Southern Pacific, with headquarters at San Francisco, Cal., has been engaged in railway work for nearly 26 years, all of which have been in the service of that railroad. He was born in 1888 at Rocklin, Cal., and obtained his first railway experience at the age of 17 years as a locomotive fireman on the Southern Pacific. Later he was advanced successively through the positions of yardman, engine foreman, yardmaster at the Roseville (Ore.) terminal, general yardmaster at Reno, Nev., and night yardmaster and general yardmaster at the Sacramento (Cal.) terminal. In 1915 Mr. Jordan was advanced to assistant trainmaster of the Sacramento division, and six months later he was promoted to trainmaster. In 1917 he was advanced to assistant superintendent in charge of the San Francisco terminal, then being transferred to the general manager's staff in 1920. He was transferred to the Coast division, with headquarters at San Francisco, in November, 1926, his promotion to superintendent of that division becoming effective on January 1.

James J. Jordan

TRAFFIC

B. L. Polson has been appointed general agent for the Toledo, Peoria & Western at San Francisco, Cal.

J. J. van Burk, has been appointed assistant general freight agent of the Chicago & Eastern Illinois, with headquarters at Chicago, succeeding **J. J. Clark,** deceased.

George W. Wood, who has been promoted to general through freight agent of the Chesapeake & Ohio, with headquarters at Cincinnati, Ohio, has been engaged in railway work for nearly 27

George W. Wood

years. He was born at Cincinnati, on April 4, 1888, and entered railway service at the age of 16 years as a clerk for the Kanawha Despatch Routes in that city. After occupying various clerical positions with the Kanawha Despatch he was advanced to soliciting agent in 1912 and to traveling freight agent in 1916. Mr. Wood entered the service of the Chesapeake & Ohio as soliciting agent at Cincinnati in 1920. Two years later he was advanced to general agent at the same point where he remained until 1924 when he was promoted to general traveling agent at Chicago. In 1927 he was promoted to general western freight agent at Chicago, then becoming assistant general freight agent at the same point in 1930. His further promotion to general through freight agent at Cincinnati became effective on January 1, 1931.

William McL. Pomeroy, who has been appointed freight traffic manager of the Pennsylvania, with headquarters at Pittsburgh, Pa., as announced in *Railway Age* of January 17, page 219, was born on March 7, 1887, at Chambersburg, Pa., and is a graduate of Princeton University. He began his railroad career with the Pennsylvania on March 2, 1909, as clerk in the office of the general freight agent at Philadelphia, Pa. On October 1, 1911, Mr. Pomeroy was appointed freight solicitor at Buffalo, N. Y. In July, 1914, he became chief clerk in the office of the division freight agent at Erie, Pa. From July 1, 1915 to March 1, 1916, he served as agent at Philadelphia, Pa., for the Empire Line (now part of the Pennsylvania) and during the period between March 1, 1916 and August 7, 1917, he was freight solicitor at Harrisburg, Pa. for the Union Line (now part of the Pennsylvania). From August 7, 1917 to March 1, 1919, he was engaged in military serv-

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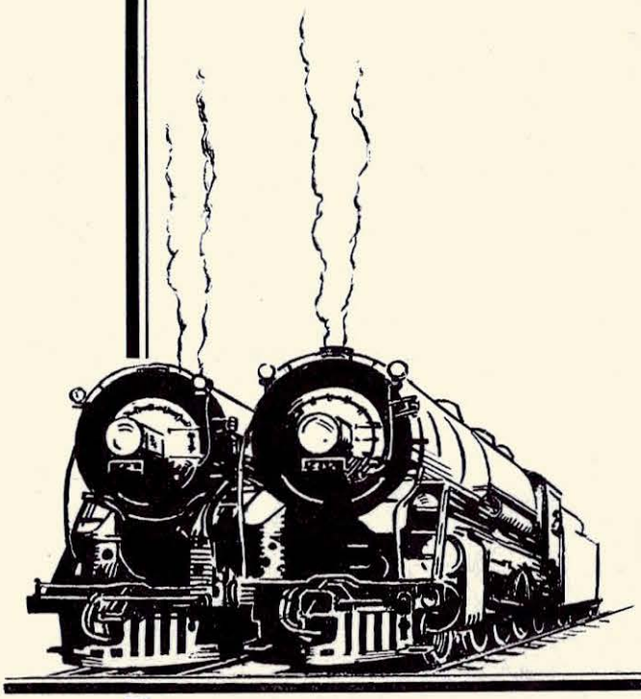
SUSTAINED BOILER PRESSURE

is absolutely necessary in this day of rapid transportation. FIREBARS not only provide it through

BETTER FIRES

but, it is a noteworthy fact that not a single steam failure from fire conditions is recorded with the thin and evenly burning fires that exist.



FIREBAR CORPORATION
CLEVELAND OHIO

FIREBAR

ice. In 1919 he re-entered the service of the Pennsylvania as representative in the office of the general freight agent at Philadelphia. From 1920 to 1921 he served as special agent in the same office and in 1921 he became assistant industrial agent. From January to July, 1922, he served as chief clerk in the office of the traffic manager at Pittsburgh, and on the latter date he was promoted to division freight agent at Buffalo. On August 1, 1925, he was appointed assistant general freight agent at Pittsburgh, and on October 16, 1927, he was advanced to general freight agent. He was transferred in the same capacity to Philadelphia on April 1, 1929, the position he held until his recent promotion.

William McL. Pomeroy

MECHANICAL

A. R. Walker, general foreman in charge of the maintenance of electrical rolling stock of the Illinois Central, has been promoted to electrical engineer—equipment, with headquarters at Chicago, succeeding **G. T. Goddard,** deceased.

ENGINEERING AND SIGNALING

S. T. W. Green has been appointed valuation engineer and real estate agent of the Lehigh & New England, with headquarters at Bethlehem, Pa.

J. S. Gillum, assistant division engineer of the Philadelphia Terminal division of the Pennsylvania, with headquarters at West Philadelphia, Pa., has been promoted to division engineer of the Erie & Ashtabula division, with headquarters at New Castle, Pa.

SPECIAL

R. R. Hackett, chief insurance inspector of the Baltimore & Ohio, has been appointed superintendent of insurance, succeeding **B. S. Mace,** recently deceased. Mr. Hackett has been in the continuous service of the B. & O. since August 3, 1900.

OBITUARY

William H. Speirs, assistant engineer on the Delaware, Lackawanna & Western, died on January 20 at the age of 51.

H. C. Stevens, general storekeeper of the Wabash and the Ann Arbor, died suddenly from a heart attack at Toledo, O., on January 12.

Charles R. Brent, who retired as assistant general freight agent of the Louisville & Nashville, at Louisville, Ky., in 1922, died at his home in that city on January 14.

Louis K. Wenning, who was auditor of receipts of the Nashville, Chattanooga & St. Louis, from 1899 to 1908, died at Munich, Germany, on January 5 at the age of 72 years.

Eli P. Clark, who was president and general manager of the Los Angeles Pacific at Los Angeles, Cal., from its organization in 1896 until its acquisition by the Southern Pacific and consolidation with the Pacific Electric in 1910, died in Los Angeles on January 16, at the age of 83 years.

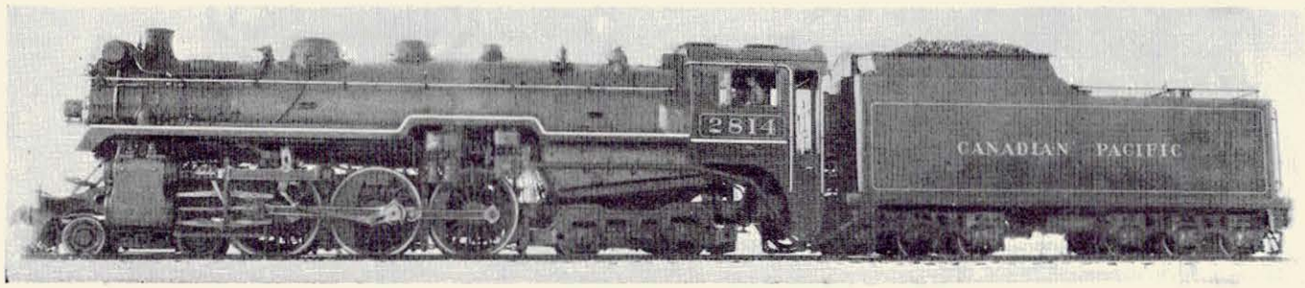
John A. Cochrane, who retired in April, 1930, as assistant to the vice-president of the Great Northern, with headquarters at St. Paul, Minn., died at his home in that city on January 20. He had been assistant to the vice president in charge of operation since 1917.

William T. Cannon, who retired as secretary, treasurer and purchasing agent of the Indianapolis Union in 1917, died at Indianapolis, Ind., on January 18 at the age of 75 years. Mr. Cannon was born at Logansport, Ind., and when 17 years old became a ticket clerk on the Indianapolis, Peru & Chicago (now part of the Wabash). In 1888, he was appointed treasurer of the Indianapolis Union, later taking over the duties of secretary and then of purchasing agent. Since his retirement from railway service in 1917, Mr. Cannon had been president of the Railroad Men's Building and Savings Association, a mutual benefit organization which he aided in founding in 1887.

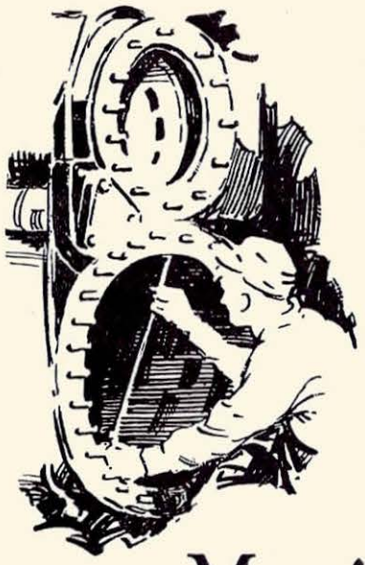
C. L. Doub, assistant engineer, electric traction, of the Reading at Philadelphia, Pa., died of pneumonia at his home in Oreland, Pa., on January 21. Mr. Doub was born on June 3, 1897, at Washington, D. C. He worked as substation operator with the Hagerstown & Frederick Railroad prior to entering Johns-Hopkins University, where he was graduated in electrical engineering in 1919. After his graduation he became connected with the railway engineering department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., and was employed by that company three years. He next was engaged for one year with the Milwaukee Electric Railway & Light Company on special traction studies. From 1923 to 1927 he was employed by the Illinois Central on its Chicago terminal electrification, and in 1927 he became assistant engineer, electric traction, engaged in the electrification of the suburban lines of the Reading in Philadelphia, which position he held at the time of his death.

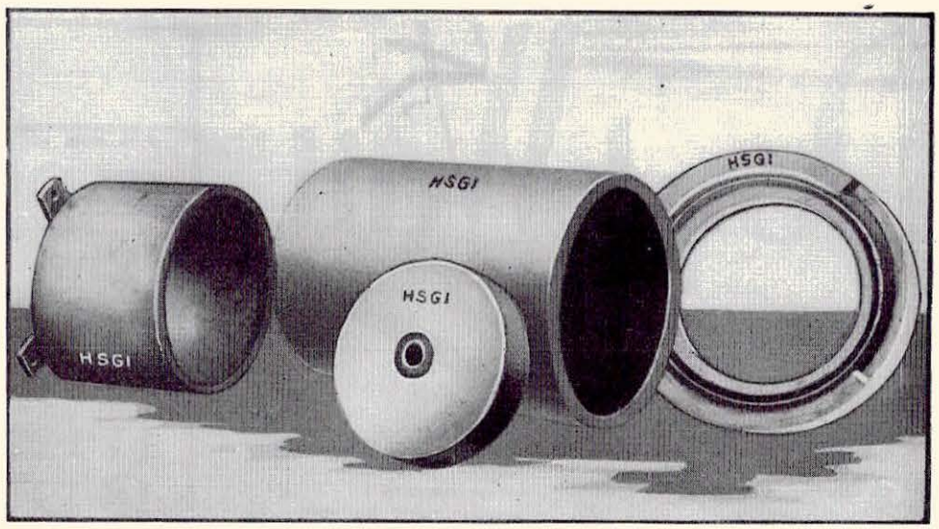
C. L. Doub

* * * *



Canadian Pacific 4-6-4 Type Locomotive Built by the Montreal Locomotive Works, Ltd.





Maximum Cylinder Efficiency

THE constant increase in boiler pressures, superheat temperatures and cylinder diameters makes it extremely difficult to maintain *maximum cylinder efficiency* with ordinary materials — and the cost is prohibitive.

Most of the leading railroads are solving this problem by standardizing on cylinder wearing parts made of HUNT-SPILLER *Air Furnace* GUN IRON.

The resistance of this material to frictional wear and high temperatures insures steam tight operation and a savings in fuel and maintenance costs.

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Cylinder Bushings
Cylinder Packing Rings
Pistons or Piston Bull Rings
Valve Bushings
Valve Packing Rings
Valve Bull Rings
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Floating Rod Bushings

Parts Finished for Application

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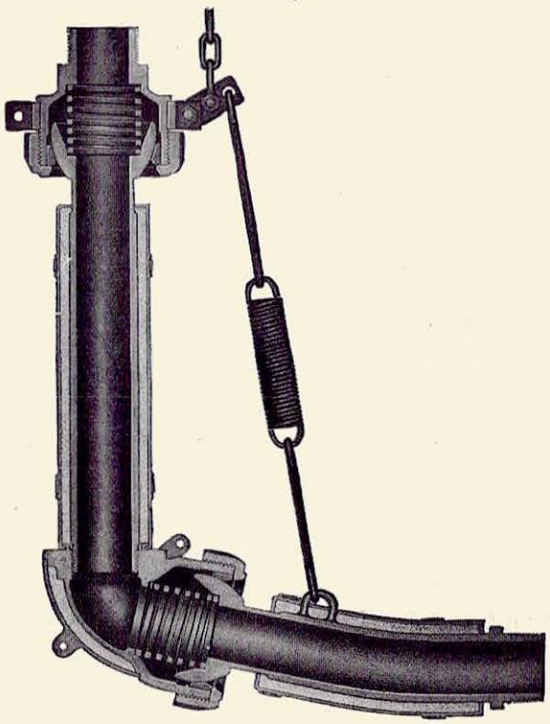
Don't Wait Until

According to the new A.R.A. ruling all non-passenger carrying cars in interchange passenger service must be equipped with 2″ metallic connections prior to October, 1931.

Now is the Time



BARCO Metallic Steam Heat Connections require only two gaskets per connection—they cannot blow out and will give steam tight service for at least a year between renewals.

AS long as the job must be done before October, why not do it now? The savings effected by BARCO Metal Steam Heat Connections *during the present steam heating season* will almost pay the conversion costs.

Why worry the rest of this winter about the comforts of your passenger trains? Why continue the high cost of replacing hose and the waste of fuel through leaky connections?

BARCO Metal Steam Heat Connections carry steam without leaking. They are fully insulated and the insulation is protected with a steel jacket.

There are no 90 degree bends—no metal to metal contact of wearing parts. Their all steel construction insures many years of dependable service. In case of accident they can be easily welded. Stock parts are reduced to minimum.

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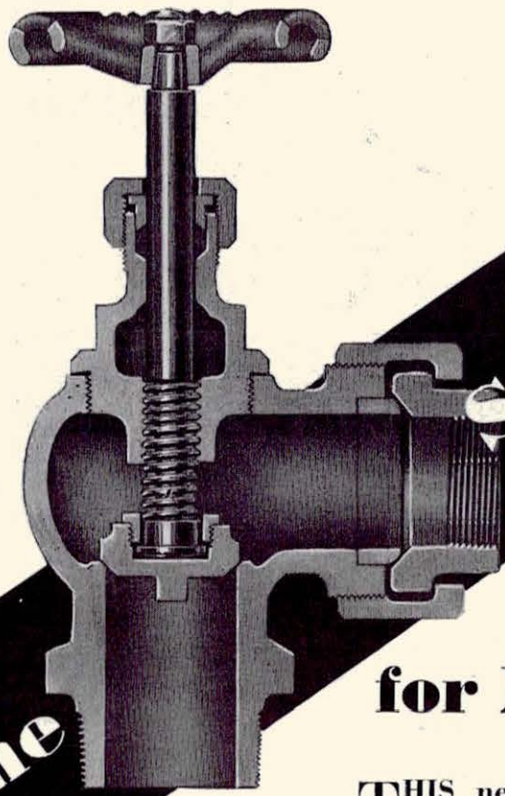
BARCO Railway Devices



The Super Steam Valve

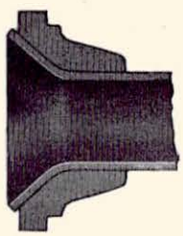
an Improved Design for Modern Conditions

THIS new steam throttle valve for air compressors, while designed primarily for locomotives using high pressure superheat steam, has superior advantages that warrant its general use.

The valve is rugged and durable. There is but one standard size, which can be used with any size steam pipe merely by applying the proper swivel—thus affording decided economies in stock keeping.

The body of the valve is made of cast steel to withstand pressures up to 500 lbs.—and is so marked. Internal parts are made of well-known alloys that have high tensile strength and will resist corrosive action of steam, up to 700° superheat.

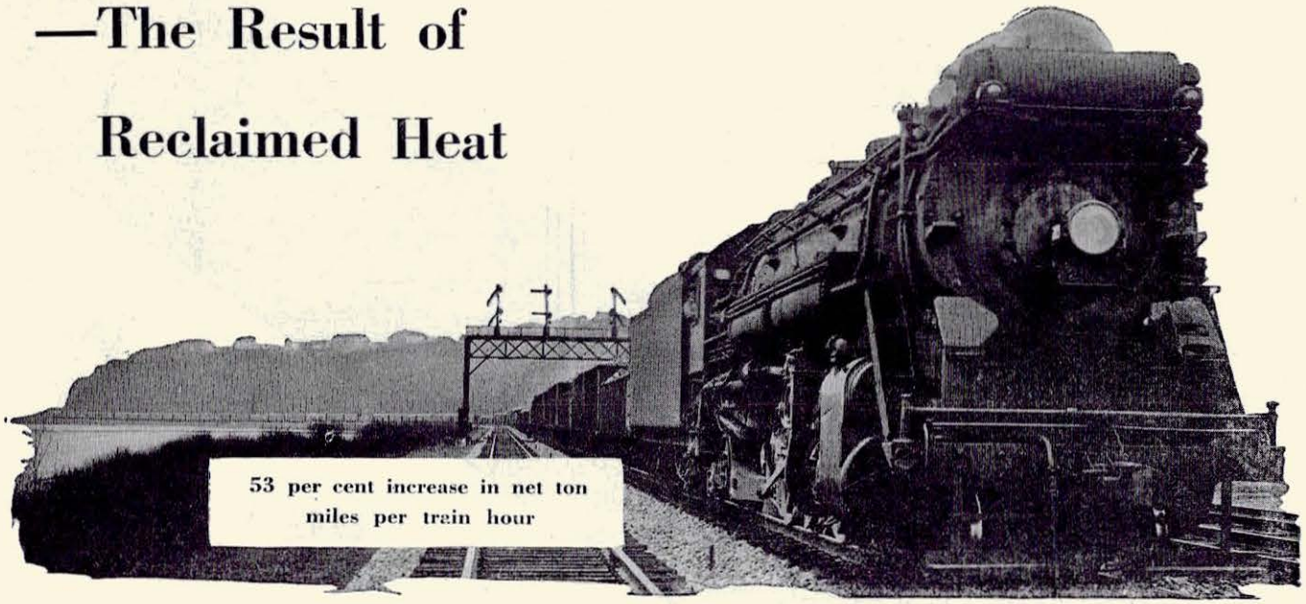
Complete information about the Super Steam Valve is contained in Circular Notice 1094—a copy of which is yours for the asking . . . WESTINGHOUSE AIR BRAKE CO., General Office and Works, Wilmerding, Pa.



Swivels for either iron pipe or copper tube are available in various sizes . . .

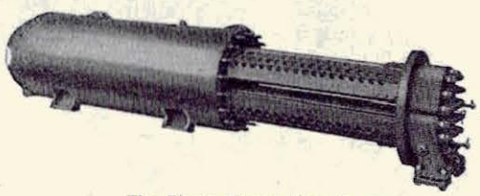
Improved Performance

—The Result of Reclaimed Heat



COINCIDENT with the striking improvement accomplished in train operation, a marked change has taken place in the standard of locomotive performance during the past few years. As a result there has been an increase in net ton miles per train hour of 53 per cent in 1929 over 1923; a year when it was considered that railroad efficiency reached a high level.

Elesco CF type boiler feed pump



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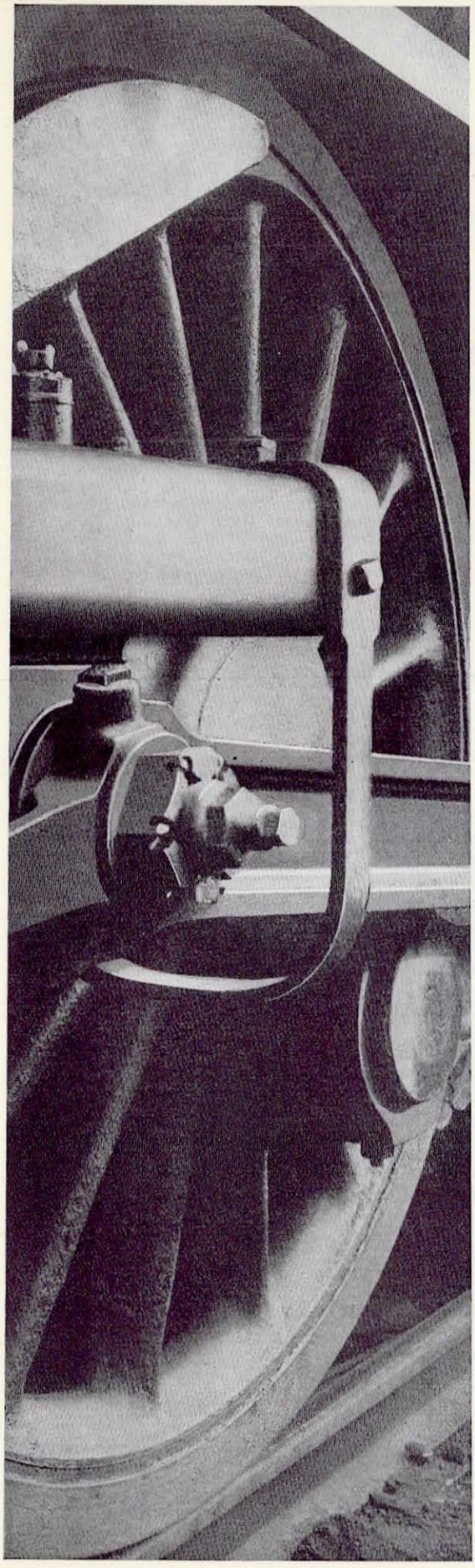

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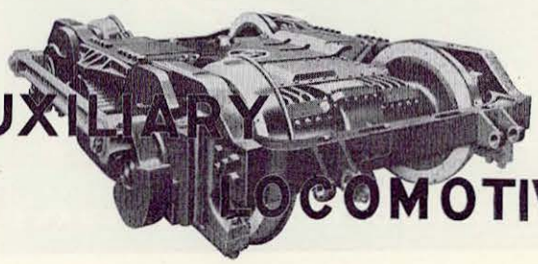

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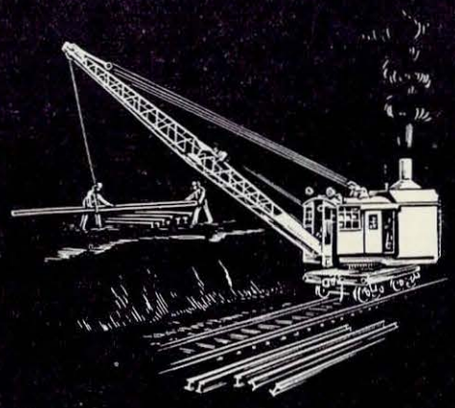

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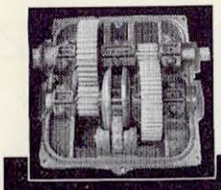

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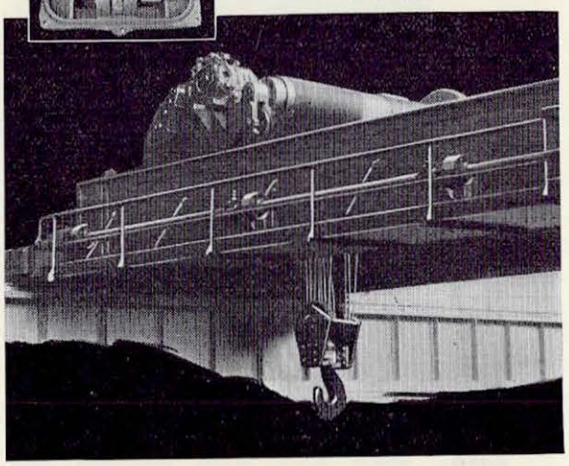

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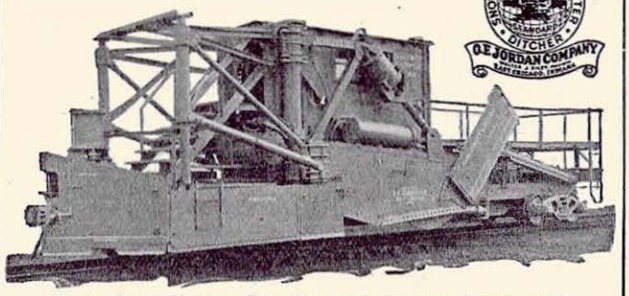

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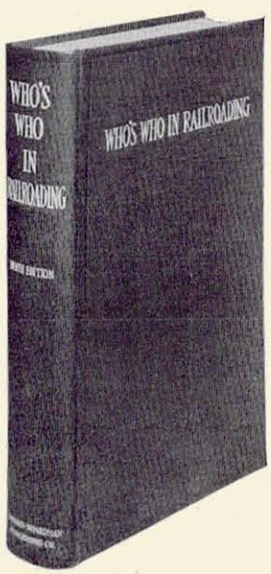

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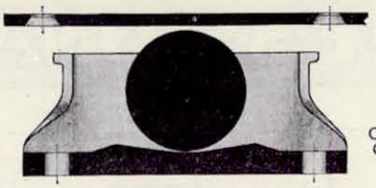

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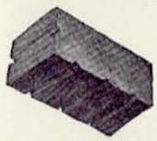

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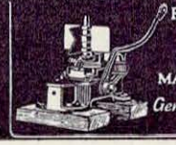

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For location of advertisements of manufacturers listed in the Buyers Index, see Alphabetical Index on the last page next to cover

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Angles, Channels and Tees—(See Shapes, Structural).

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Miner, W. H.
Shafer Bearing Corp'n.
S. K. F. Industries, Inc.
Standard Car Truck Co
Stucki Co., A.
Timken Roller Bearing Co.
Wine Railway Appliance Co.

Bearings, Roller Side.
Q. & C. Company, The
Standard Coupler Co.

Bearings, Side.
American Steel Foundries.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
Standard Car Truck Co.
Wine Railway Appliance Co.

Beds, Cast Steel, Locomotive.
General Steel Castings Corp.

Bell Ringer, Locomotive.
Ardco Mfg. Co.
Prime Mfg. Co., The

Bells, Highway Crossing.
Railroad Supply Co.

Belt Lacing Machines.
Birdsboro Steel Foundry & Mach. Co.

Benders, Rail.
Q & C Co., The

Bending and Straightening Machines.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Billets, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Interstate Iron & Steel Co.
McConway & Torley Co.
Midvale Co., The
Ryerson & Son, Jos. T.
Republic Steel Corp.
Standard Steel Works Co.

Blocks, Chain.
Barco Mfg. Co.
Yale & Towne Manufacturing Co.

Blocks, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison-Wright Co.

Blooms, Steel.
Carnegie Steel Co.
Republic Steel Corp.
Interstate Iron & Steel Co.

Blow Pipe Systems, Pneumatic.
Mahon Co., R. C.

Blower Fittings, Automatic Smokebox.
Barco Mfg. Co.

Blowers, Soot.
Rees Mfg. Co.

Blowers, Turbo.
Ingersoll-Rand Co.

Blow Off Line Joints, Roundhouse—(See Joints, etc.)

Blowtorches, Acetylene.
Oxweld Railroad Service Co., The

Boiler Checks.
Prime Manufacturing Co., The

Boilers, Locomotive.
American Locomotive Co.
Baldwin Locomotive Works
Lima Locomotive Works.

Boilers, Scale Proof.
Industrial Brownhoist Corp.

Bolsters, Steel.
American Steel Foundries.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Brill Co., The J. G.
Buckeye Steel Castings Co
Gould Coupler Co., The
Mt. Vernon Car Mfg. Co.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Symington & Son, Inc., T. H

Bolsters, Steel.
Ohio Steel Foundry Co., The.

Bolts and Nuts.
Bethlehem Steel Co.
Buffalo Brake Beam Co.
Dardelet Threadlock Corp.
Neely Nut & Bolt Co.
Russell, Burdsall & Ward Bolt and Nut Co.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Bolts & Nuts, Monel Metal.
International Nickel Co., The.

Bolts, Patch.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Bolts, Track.
Illinois Steel Co.
Inland Iron & Steel Co.

Bonders, Rail.
Q & C Co., The.

Bonding Rail Outfits.
Ingersoll-Rand Co.

Bonds, Rail.
American Steel & Wire Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Bonds, Signal.
American Steel & Wire Co.
General Cable Corp.
Railroad Supply Co.

Bond Wire Protection.
P & M Co., The

Boosters, Locomotives.
Franklin Railway Supply Co., Inc.

Boring & Drilling Machines, Horizontal.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Boring Machines, Car Wheel.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Horizontal.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Vertical.
Sellers & Co., Inc., Wm.

Braces, Rail.
Bettendorf Co., The
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
Q. & C. Co., The.
Ramapo Ajax Co.
Symington Co., The.

Brake Beam Safety Guards.
Chicago Railway Equipment Co.

Brake Beam Supports.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Davis Brake Beam Co.

Brake Beams.
American Steel Foundries
Bradford Corporation.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Davis Brake Beam Co.
Hunt-Spiller Mfg. Corp.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.

Brake Drums.
American Car & Foundry Motors Co.
Hunt-Spiller Mfg. Corp.

Brake Forgings, Pins, Levers, etc.
American Steel Foundries
Brill Co., The J. G.
Davis Brake Beam Co.
Mt. Vernon Car Mfg. Co
Schaefer Equipment Co

Brakes, Hand.
National Brake Co.

Brake Heads.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Davis Brake Beam Co.
Pressed Steel Car Co.

Brake Jaws.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.
Steel Car Forge Co.

Brake Shoes.
American Brake Shoe & Foundry Co.
American Steel Foundries.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Fort Pitt Malleable Iron Co.
Mt. Vernon Car Mfg. Co.

Brakes, Air.
General Electric Co.
Westinghouse Air Brake Co.

Brakes, Clasp.
American Steel Foundries.

Brakes, Electric.
Westinghouse Air Brake Co.

Brakes, Hand.
Miner, W. H.
National Brake Co.
National Malleable & Steel Castings Co.
Wine Railway Appliance Co.

Brass, Sash.
Edwards Co., O. M.

Brick, Locomotive Arch.
American Arch Co.

Bridge Builders.
American Bridge Co.
Bethlehem Steel Company.

Bridge Floors.
Armco Culvert Mfrs. Assoc.

Bridge & Crossing Plank, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Flooring.
Carey Co., The, Philip.

Bridge Material.
International Creosoting & Construction Co.

Bridge Material, Creosoted.
National Lumber & Creosoting Co.

Bridge Stringers — (See Stringers, Bridge).

Bronze Powder, Aluminum.
Aluminum Co. of America.

Bucket Handling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.

Buckets, Grab.
American Bridge Co.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Buckets, Self-Dumping.
Whiting Corporation.

Buffers, Friction.
Edgewater Steel Co.
Miner, W. H.
Standard Coupler Co.
Waugh Equipment Co.
Westinghouse Air Brake Co.

Buffers, Radial.
Franklin Railway Supply Co., Inc.

Building Materials.
Carey & Co., Philip, The.
Johns-Manville Corp.

Buildings, Iron, Steel & Steel Concrete.
American Bridge Co.
United Engineers & Constructors, Inc.

Bulldozers.
Ryerson & Son, Joseph T.

Bushings, Grease Cup.
Prime Mfg. Co., The.

Cable Accessories, Electrical.
General Cable Corp.
Graybar Electric Co.

Cables, Electric.
American Steel & Wire Co.
General Cable Corp.
General Electric Co.
Graybar Electric Co.
Ketrie Insulated Wire & Cable Co.
Okonite Co., The.

Cableways—(See Tramways)

Caps, Grease.
Prime Mfg. Co., The

Carbide Calcium.
Oxweld Railroad Co., The
Union Carbide Sales Co.

Car Insulation.
Carey & Co., Philip, The.

Car Lighting Equipment—(See Lighting Car Equipment).

Carlines.
Hutchins Car Rfg. Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Car Material, Wood.
Central Coal & Coke Co.

Car Parts and Appliances.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Car Parts, Freight.
Bettendorf Co., The.
General American Tank Car Corporation.
Pressed Steel Car Co.

Car Parts, Passenger.
Brill Co., The J. G.
St. Louis Car Co.

Car Repairs.
General American Tank Car Corporation.
Pressed Steel Car Co.
St. Louis Car Co.
Tennessee Coal, Iron & Railroad Co.

Car Retarder Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Car Siding (See Siding Car, etc.)

Car Washers.
Whiting Corporation.

Car Washers and Scrubbers Combined.
Whiting Corporation.

Cars, Baggage.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Cars, Ballast.
Bethlehem Steel Company.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Caboose, Coal & Stock.
Mt. Vernon Car Mfg. Co.

Cars, Convertible.
Mt. Vernon Car Mfg. Co.

Cars, Dump.
Bethlehem Steel Company.
Bettendorf Co., The
Differential Steel Car Co.
Magor Car Corporation.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Flat, Narrow Gauge.
Bettendorf Co., The.
Western Wheeled Scraper Co.

Cars, Freight.
Bethlehem Steel Co.
Bettendorf Co., The
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Co.

Cars, Freight (New and Repaired).
Bethlehem Steel Company.
Bettendorf Co., The.
Pressed Steel Car Co.

Cars, Gasoline-Electric.
Brill Co., The J. G.
Electro-Motive Co.
St. Louis Car Co.

Cars, Gasoline Motor.
Brill Co., The J. G.
St. Louis Car Co.

Cars, Hand & Push.
Fairbanks-Morse & Co.

Cars, Industrial.
Bethlehem Steel Company.
Brill Co., The J. G.
Pressed Steel Car Co.
Western Wheeled Scraper Co.
Whiting Corporation.

Cars, Motor.
Fairbanks-Morse & Co.

Cars, Motor Inspection.
Fairbanks-Morse & Co.

Cars, Oil Electric.
Westinghouse Elec. & Mfg. Co.

Cars, Ore.
Brill Co., The J. G.
Pressed Steel Car Co.

Cars, Passenger.
Bethlehem Steel Company.
Brill Co., The J. G.
Electro Motive Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.
St. Louis Car Co.

Cars, Power Units.
Brill Co., The J. G.
Electro Motive Co.

Cars, Quarry.
Western Wheeled Scraper Co.

Cars, Rebuilt and Repaired.
Bettendorf Co., The
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Refrigerator.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Cars, Second-Hand.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Self-Propelled Passenger.
Brill Co., The J. G.
Electro Motive Co.
General Electric Co.
Pullman Car & Mfg. Corp.
Westinghouse Elec. & Mfg. Co.

Cars, Spreader.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Cars, Tank.
Bethlehem Steel Company.
General American Tank Car Corp.
Pressed Steel Car Co.

Carts, Dump.
Western Wheeled Scraper Co.

Castings, Alloy Steel.
Symington Co., The
Union Spring & Mfg. Co.

Castings, Brass and Bronze.
General Railway Signal Co.
Magnus Co., Inc.
National Bearing Metals Corp.
Union Switch & Signal Co.

Castings, Gray Iron.
American Brake Shoe & Foundry Co.
American Locomotive Co.
Baldwin Locomotive Works
General Railway Signal Co.
Mt. Vernon Car Mfg. Co.
Rampo Ajax Corp.
Union Switch & Signal Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corp.

Castings, Iron & Steel.
Industrial Brownhoist Corp.

Castings, Malleable Iron.
Buckeye Steel Castings Co.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
P & M Company, The.
Pressed Steel Car Co.
Symington Co., The
Universal Draft Gear Attachment Co.

Castings, Monel Metal.
International Nickel Co., The.

Castings, Steel.
Allegheny Steel Co.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach Co.
Buckeye Steel Castings Co.
General Steel Castings Corp.
Gould Coupler Co., The
McConway & Torley Co.
Midvale Co., The.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Universal Draft Gear Attachment Co.

Castings, Steel Loco.
Birdsboro Steel Foundry & Mach. Co.
General Steel Castings Corp.
Gould Coupler Co., The
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Castings, Steel Vanadium.
Birdsboro Steel Foundry & Mach Co.
Brill Co., The J. G.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Catchbasins, Corrugated Iron.
Armco Culvert Mfrs. Assoc.

Cellers, Engine Truck.
Ardco Mfg. Co.

Cement Car, Asphalt.
Lehon Co., The
Sherwin-Williams Co.

Cement, High Temperature.
Carey Co., Philip, The.
Johns-Manville Corp.

Cements, Asbestos and Magnesia.
Carey Co., Phillip, The.

Center Plates — (See Bearings, Center).

Center Sills.
Bettendorf Co., The.
Bradford Corporation.

Chain Monel Metal.
International Nickel Co. The.

Chemicals.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.

Chemicals, Boiler.
Bird-Archer Co., The.

Chemicals, Cleaning.
Oakite Products, Inc.

Chemists.
Bird-Archer Co., The
Dearborn Chemical Co.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Chromium.
Electro Metallurgical Sales Corp.

Chromium Plating.
Worthington Pump & Machinery Corp.

Chucks, Lathe.
Ryerson & Son, Jos. T.

Cinder Handling Plants.
Roberts & Schaefer Co.

Circuit Breakers.
General Electric Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Clamps, Flanging.
Ryerson & Sons, Jos. T.

Clamps, Guard Rail.
O. & C. Co., The.
Westinghouse Air Brake Co.

Clamps, Hose.
Ingersoll-Rand Co.
National Malleable & Steel Castings Co.
Vapor Car Heating & Lighting Co.
Westinghouse Air Brake Co.

Clamps, Pipe.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

Clamps, Rail Cutting.
Oxweld Railroad Service Co., The.

Classification Yard Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Cleaners, Aircraft.
Oakite Products, Inc.

Cleaners, Air Pump.
Oakite Products, Inc.
Westinghouse Air Brake Co.

Cleaners, Bus & Truck.
Oakite Products, Inc.

Cleaners, Car.
Oakite Products, Inc.

Cleaners, Flue.
Ryerson & Son, Jos. T.

Cleaners, General.
Oakite Products, Inc.

Cleaners, Locomotive.
Oakite Products, Inc.

Cleaners, Metal.
Oakite Products, Inc.

Clips, Wire Rope.
American Hoist & Derrick Co.

Coach and Coach Yard Steam Joints—(See Joints, etc.)

Coaches, Motor.
American Car & Foundry Motors Co.
Dodge Motor Truck Corp.
International Harvester Co.
White Co., The.

Coaches, Second-Hand.
Hyman-Michaels Co.

Coal, Ore & Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.
Roberts & Schaefer Co.

Coal Pushers.
Standard Stoker Co.

Coaling Stations.
American Bridge Co.
Fairbanks-Morse & Co.
Roberts & Schaefer Co.

Cocks, Angle.
Westinghouse Air Brake Co.

Cocks, Blow-Off.
Bird-Archer Co., The.

Cocks, Cylinder.
Prime Manufacturing Co., The.

Collecting System, Dust.
Whiting Corporation.

Columns, Water.
Prime Manufacturing Co., The.

Combination Crane Pile Drivers.
Industrial Brownhoist Corp.

Compounds, Boiler.
Dearborn Chemical Co.
Bird-Archer Co., The
General Electric Co.

Compounds, Cleaning.
Oakite Products, Inc.

Compounds, Cutting.
Oakite Products, Inc.

Compounds, Grinding.
Oakite Products, Inc.

Compounds, Paint Removing.
Oakite Products, Inc.

Compounds, Rust Proofing.
Oakite Products, Inc.

Compressors, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Concrete Floor Slabs.
Federal American Cement Tile Co.

Concrete Reinforcement.
American Steel & Wire Co.
Carnegie Steel Co.
Ryerson & Sons, Jos. T.

Concrete Roofing, Tile.
Federal American Cement Tile Co.

Condensers.
Ingersoll-Rand Co.

Condensing Apparatus.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Conduit, Rigid.
Aluminum Co. of America.

Conduits, Metallic Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Graybar Electric Co.
Vapor Car Heating Co., Inc.

Conduit, Underground.
Graybar Electric Co.
Johns-Manville Corp.

Connections.
Prime Manufacturing Co., The.

Connections, Lever.
National Malleable & Steel Castings Co.

Connections, Truck.
National Malleable & Steel Castings Co.

Connections, Truck Lever.
Schaefer Equipment Co.

Contraction Joint.
General Railway Signal Co.

Control Devices, Train Speed.
Union Switch & Signal Co.

Control, Locomotive.
Valve Pilot Co.

Controllers, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Conveying Machinery.
American Bridge Co.
Clark Tructractor Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Corrugated Sheet.
Aluminum Co. of America.

Conveyor, Ash — (See Coal Ore and Ash Handling Mach.)

Coupler Pockets—(See Draft Yokes.)

Coupler Yokes.
Bettendorf Co., The.
Gould Coupler Co.
Symington Co., The.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
McConway & Torley Co.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Westinghouse Air Brake Co.

Couplings, Hose.
Fort Pitt Malleable Iron Co.
Gold Car Heating & Lighting Co.
Ingersoll-Rand Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co

Cranes, Ballast Cleaning.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Barge.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Bracket.
Shephard-Niles Crane & Hoist Corp.
Whiting Corporation.

Cranes, Crawler.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Crawling Shovels and Draglines.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton, Crane & Shovel Co.

Cranes, Diesel.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Electric Traveling.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.

Cranes, Gantry.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Shephard-Niles Crane & Hoist Corp.
Whiting Corporation

Cranes, Gasoline.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co
Orton Crane & Shovel Co.

Cranes, Grab Bucket.
American Hoist & Derrick Co.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Handpower.
American Hoist & Derrick Co.
Shephard-Niles Crane & Hoist Corp.
Whiting Corporation.

Cranes, Jib.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.
Worthington Pump & Machinery Corp.

Cranes, Locomotive.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Magnet.
Whiting Corporation.

Cranes, Overhead.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Pillar.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.

Cranes, Portable.
American Hoist & Derrick Co.
Clark Tructractor Co.

Orton Crane & Shovel Co.
Cranes, Tractor.
Orton Crane & Shovel Co.
Cranes, Transfer.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.
Cranes, Traveling.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.
Cranes, Wharf.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Cranes, Wrecking.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.
Crank Pins — (See Pins, Cranks).
Creosote.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison Wright Co.
Cribbing Units.
Federal American Cement Tile Co.
Cross Arms.
American Bridge Co.
General Electric Supply Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
Cross-Over Bridges, Freight House.
Whiting Corporation.
Cross Ties.
Century Wood Preserving Co.
International Creosoting & Construction Co.
Cross Ties, Creosoted.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Cross Ties, Steel.
Bethlehem Steel Co.
Crossheads & Shoes.
Baldwin Locomotive Wks.
Barco Mfg. Co.
International Creosoting & Construction Co.
Crossing Signals & Signs.
Railroad Supply Co.
Crossings — (See Frogs and Crossings).
Crossings, Pavement.
Carey Co., The Philip
Crushers, Coal.
American Sheet & Tin Plate Co.
Orton Crane & Shovel Co.
Culverts.
Armco Railroad Sales Co.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Toncan Culvert Manufacturers' Association.
Culverts Corrugated.
Armco Culvert Manufacturers' Association.
Republic Steel Corp.
Culverts, Paved Invert.
Armco Culvert Mfrs. Assoc.
Cupolas, Foundry.
Whiting Corporation.
Hammett, H. G.
Cups, Oil.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.
Curtains, Cab
Lehon Co., The
Curtains & Fixtures, Car Window.
Pantasote Co., Inc., The.
Curtain Material, Car.
Ryerson & Son, Jos. T.
Cutting & Welding Apparatus.
Oxweld Railroad Service Co.
Westinghouse Elec. & Mfg. Co.
Cut-Off Indicators & Recorders.
National Tube Co.
Valve Pilot Co.
Cylinders, Air Brake.
Westinghouse Air Brake Co.
Cylinders, Cast Steel Locomotive.
General Steel Castings Corp.
Union Steel Casting Co.
Cylinders, Oxy-Acetylene.
Oxweld Railroad Co., The
Deoxidizers.
Q & C Co., The.
Vanadium Corp. of America.
Derricks.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Diesel Electric Power Plants
Fairbanks-Morse & Co.
Westinghouse Elec. & Mfg. Co.
Dirt Collectors.
Westinghouse Air Brake Co.
Disinfectants.
West Disinfecting Co.
Dispatching Systems.
General Railway Signal Co.
Union Switch & Signal Co.
Ditchers.
American Hoist & Derrick Co.
Jordan Co., O. F.
Ditching Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.
Door Fixtures—(See Fixtures Car Door).
Doors, Car.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
Wine Railway Appliance Co.
Doors, Folding, Rolling and Sliding.
Kinnear Manufacturing Co.
Doors, Locomotive Firebox.
Franklin Railway Supply Co., Inc.
Doors, Steel.
Kinnear Manufacturing Co.
Doors, Rolling, Steel.
Kinnear Mfg. Co.
Mahon Co., R. C.
Doors, Wood.
Kinnear Mfg. Co.
Draft Arms.
American Steel Foundries.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Symington Co., The.
Universal Draft Gear Attachment Co.
Draft Gear Attachments.
Symington Co., The.
Draft Gears.
American Steel Foundries.
Bradford Corporation.
Cardwell-Westinghouse Co.
Edgewater Steel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.
Draft, Yokes
American Steel Foundries.
Bettendorf Co., The.
Buckeye Steel Castings Co.
Gould Coupler Co., The
McConway & Torley Co.
Miner, W. H.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Co.
Symington Co., The
Universal Draft Gear Attachment Corp.
Draglines.
Orton Crane & Shovel Co.
Drainage Gates.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Drains, Perforated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Drawbar Centering Device.
Gould Coupler Co., The
Miner, W. H.
Drawbars, Unit Safety.
Franklin Railway Supply Co., Inc.
Industrial Brownhoist Corp.
Dredging Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Drilling Machines.
Sellers & Co., Inc., Wm.
Drilling Machines, Bonding.
Railroad Supply Co.
Drilling Machines, Pneumatic.
Ingersoll-Rand Co.
Drilling Machines, Rock.
General Electric Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.
Drilling Machines, Upright and Radial.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Drills.
Ingersoll-Rand Co.
Drills, Close Corner.
Ingersoll-Rand Co.
Drills, Concrete.
Ingersoll-Rand Co.
Drills, Steel Rock and Steel Sharpened.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.
Drills, Track & Bending.
Bird-Archer Co., The.
Ingersoll-Rand Co.
Drinking Cups.
U. S. Envelope Co.
Drive Gas Electric Coaches.
General Electric Co.
Drive Gas Electric Locomotives
Westinghouse Elec. & Mfg. Co.
Driving Boxes (Extended Main).
Franklin Railway Supply Co., Inc.
Drop Door Mechanism.
Wine Railway Appliance Co.
Drop Trucks, Transformer.
Whiting Corporation.
Drop Tables, Electric.
Whiting Corporation.
Drop Testing Machinery.
Whiting Corporation.
Drying Ovens.
Mahon Co., R. C.
Dynamos — (See Generators Electric).
Electrical Cable Accessories.
General Cable Corp.
General Electric Supply Corp.
Electric Cables.
General Cable Corp.
General Electric Supply Corp.
Electrical Instruments.
Electric Service Supplies. Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.
Electrical Supplies.
General Electric Co.
General Electric Supply Corp.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.
Electrification, Railroad.
Battey & Kipp.
General Electric Co.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.
Electric Heaters.
General Electric Supply Corp.
Electrical Insulation.
General Cable Corp.
General Electric Supply Corp.
Electrical Porcelain Insulators.
General Electric Supply Corp.
Electric Motors.
General Electric Supply Corp.
Electric Rivet Heaters.
General Electric Supply Corp.
Electric Switches.
General Electric Supply Corp.
Enamels.
Sherwin-Williams Co.
End Frames, Cast Steel, Passenger Car
General Steel Castings Corp.
Ends, Steel.
Hutchins Car Rfg. Co.
Union Metal Products Co.
Engineers, Consulting, Civil. Elec., Hydraulic, Mechanical.
Battey & Kipp.
Hunt Co., Robt. W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Engineers, Contracting.
Battey & Kipp.
United Engineers & Constructors, Inc.
Engineers and Contractors.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Engineers, Construction.
Battey & Kipp.
Roberts & Schaefer Co.
United Engineers & Constructors, Inc.
Engineers and Contractors, Elec. Hydraulic, Mech.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
Roberts & Schaefer Co.
Engineers, Inspecting.
Gulick-Henderson Co.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
United Engineers & Constructors, Inc.
Engineers, Valuation.
Hunt Co., Robert W.
United Engineers & Constructors, Inc.
Engines, Crude & Fuel Oil.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.
Engines, Diesel.
Worthington Pump & Machinery Corp.
Engines, Gas.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.
Engines, Gas & Gasoline.
American Car & Foundry Motors Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.
Engines, Hoisting.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.
Envelopes.
U. S. Envelope Co.
Excavators.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Exhaust & Heater Pipe.
Union Asbestos & Rubber Co.
Exhaust & Ventilating Fans.
General Electric Supply Corp.
Expanders, Tube.
Ryerson & Son, Joseph T.
Explosives.
American Steel & Wire Co.
Extinguishers, Fire.
Pyrene Manufacturing Co.
Fans, Exhaust & Ventilating.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.
Fasteners, Car Door.
Camel Sales Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Feed Water Heater Systems.
Bird-Archer Co., The.
Coffin, Jr., Co., The J. S.
Worthington Pump & Machinery Corp.
Fence Posts.
International Creosoting & Construction Co.
Fencing Wire — (See Wire Fence).
Fence Posts, Creosoted.
National Lumber & Creosoting Co.
Ferro Alloys.
Vanadium Corp. of America.
Ferro, Chromium.
Vanadium Corp. of America.
Ferro Molybdenum.
Electro Metallurgical Sales Corp.
Vanadium Corp. of America
Ferro Silicon.
Vanadium Corp. of America.
Ferro Tungsten.
Vanadium Corp. of America.
Ferro Vanadium.
Vanadium Corp. of America.
Filters, Air.
Westinghouse Air Brake Co.
Whiting Corporation.
Filters, Dust.
Whiting Corporation.
Filters, Water & Industrial.
Graver Tank & Mfg. Corp.
Filtration Plants, (Water).
Graver Tank & Mfg. Corp.
Fireboxes.
American Locomotive Co.
Baldwin Locomotive Works
Fire Fighting & Protection Equipment.
Johns-Manville Corp.
Fittings, Air Brakes.
Westinghouse Air Brake Co.
Fittings, Steam.
Vapor Car Heating Co., Inc.
Fixtures, Car Door.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Flangers, Snow.
Q & C Co., The.
Floodlights.
General Electric Supply Corp.
Graybar Electric Co.
Oxweld Railroad Service Co.
Pyle-National Co.
Symington Co., The.
Westinghouse Elec. & Mfg. Co.
Floodlights, Acetylene.
Oxweld Railroad Service Co., The.
Flooring.
Carey & Co., Philip, The.
Jennison-Wright Co.
Johns-Manville Corp.
Flooring, Car.
Tuco Products Corp.
Flooring, Coach.
Tuco Products Corp.
Flooring, Composition.
Johns-Manville Corp.
Tuco Products Corp.
Flooring, Creosoted.
Central Coal & Coke Co.
Flooring, Wood.
Central Coal & Coke Co.
Century Wood Preserving Co.
Floor Plates, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Floor Slabs, Concrete.
American Cement Tile Mfg. Co.
Flue Cleaners—(See Cleaners, Flue).
Flue Cutters—(See Cutters, Flue).
Flues, Boiler — (See Tubes Boiler).
Flue Shop Equipment.
Ryerson & Son, Joseph T.
Forges, Rivet Heating.
Ryerson & Son, Joseph T.
Forging Hammers.
Industrial Brownhoist Corp.
Forgings.
American Bridge Co.
American Steel Foundries.
Bethlehem Steel Company.

Brill Co., The J. G.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Gould Coupler Co., The
Illinois Steel Co.
Midvale Co., The.
Mt. Vernon Car Mfg. Co.
Neely Nut & Bolt Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Universal Draft Gear Attachment Co.

Forgings, Drop.
Brill Co., The J. G.
General Railway Signal Co.
Steel Car Forge Co.
Union Switch & Signal Co.

Forgings, Monel Metal.
International Nickel Co., The.

Foundry Equipment.
Whiting Corporation.

Foundry Supplies.
Bird-Archer Co., The

Frames, Cast Steel, Locomotive
General Steel Castings Corp.

Frames, Locomotive.
American Steel Foundries.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Mach. Co.
Ohio Steel Foundry Co., The.
Union Steel Casting Co.

Frames, Truck.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Buckeye Steel Castings Co.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Pyle-National Co.
Symington Co., The

Frames, Vanadium.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Mach. Co.
Union Steel Casting Co.

Frogs and Crossings.
Bethlehem Steel Company.
Continuous Rail Crossing Corp.
Ramapo Ajax Corp.

Fulcrums, Brake Beam.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
National Malleable & Steel Castings Co.

Furnaces, Electric.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Furnaces, Gasoline.
Railroad Supply Co.
Whiting Corporation.

Furnaces, Rivet Heating — (See Forges, Rivet Heating).

Furniture.
Aluminum Co. of America.

Gage Testers—(See Testers Gage).

Gages, Air.
Westinghouse Air Brake Co.

Gages, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Gages, Steam.
Ashton Valve Co.

Gages, Tire.
Schrader's Son, Inc., A.

Gages, Wheel Press Recording.
Ashton Valve Co.

Gaskets.
Westinghouse Air Brake Co.

Gasoline.
Ethyl Gasoline Corp.

Gear Blanks, Rolled Steel.
Edgewater Steel Co.
Standard Steel Works Co.

Gears and Pinions.
American Steel Foundries
Westinghouse Elec. & Mfg. Co.

Gears, Silent.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Gears, Valve — (See Valve Gears).

Generators, Acetylene.
Oxweld Railroad Service Co.

Generators, Car Lighting.
Safety Car Heating & Lighting Co.

Generators, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Goggles, Welding.
Oxweld Railroad Service Co., The.
Sunbeam Electric Mfg. Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Graphite Penetrating Oil.
Alemite Mfg. Corp.

Grapples, Wood.
Industrial Brownhoist Corp.

Grate Bars.
Q & C Co., The.

Grate Shakers, Automatic.
Franklin Railway Supply Co., Inc.

Grates.
Firebar Corp.

Greases.
Alemite Mfg. Corp.

Grease Forming Machines.
Franklin Railway Supply Co., Inc.

Grey Iron.
American Brake Shoe & Foundry Co.

Grinding Machines.
Sellers & Co., Inc., Wm.

Grinding Machines, Portable.
Ingersoll-Rand Co.

Guard Rails, Creosoted Wood
International Creosoting & Construction Co.

Guard Rails, Foot Guard.
Q & C Co., The.

Guard Rails (One Piece).
Bethlehem Steel Company.
Ramapo Ajax Corp.

Guard Switch Point.
Q & C Co., The.

Guards, Cattle.
American Bridge Co.

Guards, Dust.
Gould Coupler Co., The
Symington Co., The.

Hair Felt.
Johns-Manville Corp.

Hammers, Pneumatic.
Ingersoll-Rand Co.

Hammers, Riveting.
Ingersoll-Rand Co.

Hammers, Steam.
Industrial Brownhoist Corp.
Sellers & Co., Inc., Wm.

Hand Brakes—(See Brakes, Hand).

Hangers, Ball Bearing.
S. K. F. Industries, Inc

Hand Rails & Fittings.
Aluminum Co. of America

Hangers, Bottom Rod Safety.
Chicago Railway Equipment Co.

Hangers, Car Door — (See Fixtures, Car Door).

Headlight Repair Parts, Electric.
Electric Service Supplies Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Headlights, Electric.
General Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

Headlights, Reflectors & Cases.
Pyle-National Co.
Sunbeam Electric Mfg. Co

Heaters, Electric.
Gold Car Heating & Lighting Co.
Westinghouse Electric & Mfg. Co.

Heaters, Electric Rivet.
American Hoist & Derrick Co.

Heaters, Feedwater.
Graver Tank & Mfg. Corp.

Heaters, Feedwater Locomotive.
Coffin Co., Jr., The J. S.
Superheater Company, The.
Worthington Pump & Machinery Corp.

Heaters, Feed Water, Stationary.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Heating & Ventilating Apparatus.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Westinghouse, Electric & Mfg. Co.

Heating Equipment, Car.
Gold Car Heating & Lighting Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Heating Systems, Car (Electric and Steam).
Gold Car Heating & Lighting Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

High Temperature Cements.
Carey & Co., Philip, The.

Highway Crossing Protection Devices.
American Bridge Co.
Franklin Railway Supply Co., Inc.
Railroad Supply Co.

Hoists, Air.
Whiting Corporation.

Hoists, Locomotive.
Whiting Corporation.

Hoists, Car, Coach.
Whiting Corporation.

Hoists, Chain.
Milwaukee Electric Crane & Hoist Corp.
Ryerson & Son, Jos. T.

Hoists, Electric.
American Hoist & Derrick Co.
Milwaukee Electric Crane & Hoist Corp.

Hoists, Pneumatic.
Ingersoll-Rand Co.

Hoists, Portable Car.
Whiting Corporation.

Hoists, Second-Hand.
Hyman-Michaels Co.

Hoisting Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.
Milwaukee Electric Crane & Hoist Corp.

Hooks, Wrecking.
National Malleable & Steel Castings Co.

Horns, Pneuphonic.
Westinghouse Air Brake Co.

Hose, Air, Steam, Etc.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Hose, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Hose, Tender.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Ice Cutters.
Jordan Co., O. F.

Incandescent Lamps.
General Electric Supply Corp.

Indicators, Speed & Cut-off.
Valve Pilot Co.

Ingots.
Birdsboro Steel Foundry & Mach. Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Interstate Iron & Steel Co.
McConway & Torley Co.
Standard Steel Works Co.

Injectors, Exhaust Steam.
Sellers & Co., Inc., Wm.
Superheater Co., The.

Inspection of Material and Equipment—(See Engineers, Inspection).

Insulated Wire.
General Cable Corp.
General Electric Supply Corp

Insulation, Car.
Carey Co., Philip, The.
Lehon Co., The.

Insulation, Car Bldg.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co

Insulation, Electrical.
General Cable Corp.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Insulation, Exhaust & Heater Pipe.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Heat.
Carey Co., Philip, The.
Miner, W. H.

Insulation Tape.
General Electric Supply Corp.

Insulators, Electrical, Porcelain.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Interlocking Plant Equipment.
General Railway Signal Co.
Union Switch & Signal Co.

Iron Chain.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.

Iron, Charcoal.
Bethlehem Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.

Iron, Engine Bolt.
Lockhart Iron & Steel Co.

Iron, Forging Billets.
Lockhart Iron & Steel Co.

Iron, Hollow Staybolt.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Hollow Staybolt Bars.
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Pig.
Bethlehem Steel Co.

Iron, Refined.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Iron, Staybolt — (See also Staybolts).
Ewald Iron Co.
Falls Hollow Staybolt Co.
Interstate Iron & Steel Co.
Lockhart Iron & Steel Co
Reading Iron Co.
Ryerson & Son, Jos. T.

Jacking, Locomotive
Carey Co., Philip, The.

Jacks, Smoke.
Carey Co., Philip, The.
Johns-Manville Corp.

Jacks, Screw Electric—Locomotive & Car Lighting.
Whiting Corporation.

Joints, Air Reservoir.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Blow Off Line (Roundhouse).
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Coach and Coach Yard.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Flexible.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Flexible Ball.
Barco Mfg. Co.

Joints, Rail.
American Steel Foundries.
Carnegie Steel Co.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co

Joints, Steam, Air & Liquid.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Swing.
Barco Mfg. Co.
Vapor Car Heating Co., Inc.

Journal Boxes and Lids.
Allegheny Steel Co.
American Steel Foundries.
Brill Co., The J. G.
Gould Coupler Co., The.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Pullman Car & Mfg. Corp.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

Journal Oilers, Car & Locomotive.
Ardco Mfg. Co.

Keys, Brake Shoe.
Bradford Corporation.
Mt. Vernon Car Mfg. Co.
Steel Car Forge Co.
Union Spring & Mfg. Co.

Knuckles Emergency.
Q & C Co., The.

Laboratories, Testing.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Lacquers.
General Electric Supply Corp.
Sherwin-Williams Co.

Ladders, Steel Car.
Wine Railway Appliance Co.

Lagging, Locomotive.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lamps, Incandescent.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lamps, Inspector's.
Oxweld Railroad Service Co., The.

Lath, Metal.
Armco Railroad Sales Co.
Truscon Steel Co.

Lathes, Axle.
Sellers & Co., Inc., Wm.

Lathes, Engine.
Ryerson & Son, Joseph T.

Lathes, Wheel.
Sellers & Co., Inc., Wm.

Lead, White.
National Lead Co.

Lighting Equipment, Car.
Electric Storage Battery Co.
Safety Car Htg. & Ltg. Co.

Lighting Fixtures and Systems.
General Electric Supply Corp.
Graybar Electric Co.
Pyle-National Co.
Safety Car Htg. & Ltg. Co.

Lighting Plants, Gas, Electric
Sunbeam Electric Mfg. Co.

Lightning Arresters.
General Electric Supply Corp.

Line Material.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lock Nuts—(See Nut Locks).

Locomotive Water Conditioners.
Bird-Archer Co., The.

Locomotives, Contractors.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Electric.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline.
Baldwin Locomotive Works.

Locomotives, Gas-Electric.
Electro Motive Co.

Locomotives, Geared.
Lima Locomotive Works.

Locomotives, Industrial.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Mine.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Oil Engine, Electric Driven.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb & Co., Geo. D.

Locomotives, Rebuilt.
American Locomotive Co.

Locomotives, Repair Parts.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Second-Hand.
Hyman-Michaels Co.

Locomotives, Steam.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotive Stokers.
Standard Stoker Co.

Locomotive Valve Pilot.
Valve Pilot Co.

Lubricants.
Alemite Mfg. Corp.

Lubrication Equipment.
Alemite Mfg. Corp.

Lubrication Systems.
Alemite Mfg. Corp.

Lubricators, Driving Box.
Franklin Railway Supply Co., Inc.

Lubricators, Piston Rod.
Q & C Co., The.

Lumber.
Central Coal & Coke Co.
Curtin-Howe Corp.
West Coast Lumber Trade Extension Bureau.

Lumber, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lumber, Creosote Treated.
International Creosoting & Construction Co.

Lumber, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Industrial Lumber & Creosoting Co.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Machinery, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Machine Screws, Monel Metal
International Nickel Co., The.

Magnets, Lifting.
Industrial Brownhoist Corp.
Electro Metallurgical Sales Corp.

Mechanical Draft Apparatus—
(See Heating and Vent. App.)

Mechanical Stokers.
Standard Stoker Co.

Melters, Snow, Electric.
Q & C Co., The.

Metallic Flexible Conduit.
General Electric Supply Corp.

Meters, Water & Oil.
Worthington Pump & Machinery Corp.

Milling Machines, Planer Type.
Sellers & Co., Inc., Wm.

Milling Machines, Plain and Universal.
Ryerson & Son, Joseph T.

Mohair Upholstery Velvets.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Molybdenum Metal.
Vanadium Corp. of America.

Monel Metal, Rods, Sheets, Tubes, Wire, etc.
International Nickel Co., The.

Motors, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Motors & Generators.
Fairbanks-Morse & Co.

Moulding.
Aluminum Co. of America.

Movers, Locomotive.
Whiting Corporation.

Multiple V Belt Drives
Worthington Pump and chinery Corp.

Nails.
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Nipples, Air Hose.
Prime Manufacturing Co.

Nozzles, Exhaust.
Franklin Railway Supply Co., Inc.

Nozzles, Oxy-Acetylene Cutting.
Oxweld Railroad Service Co., The.

Nuts—(See Bolts and Nuts).

Nut Locks.
Dardelet Threadlock Corp.
Grip Nut Co.
Reliance Mfg. Co.

Nuts, Tank Hose.
Prime Manufacturing Co., The.

Office Appliances.
Remington-Rand Business Service

Oil-Electric Locomotives.
American Locomotive Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.

Oil Filtering & Storage Systems.
Graver Tank & Mfg. Corp.

Oil, Linseed.
National Lead Co.

Oil Plugs, Steam Chest.
Franklin Railway Supply Co., Inc.

Oxy-Acetylene Apparatus.
Oxweld Railroad Service Co., The.

Oxygen.
Oxweld Railroad Service Co., The.

Packing, Air Pump.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.

Packing, Cylinder and Valve Ring.
Hunt-Spiller Mfg. Corp.
Westinghouse Air Brake Co.

Jacking, Locomotive.
Johns-Manville Corp.

Packing, Locomotive Cab Cock.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Ring Boiler.
Union Asbestos & Rubber Co.

Packing, Semi-Metallic.
Pilot Packing Co.
Central Alloy Steel Corp.

Packing, Sheet.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Soft.
Carey & Co., Philip, The.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.

Packing, Throttle.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing.
Westinghouse Air Brake Co.

Paint Burners, Acetylene.
Oxweld Railroad Service Co., The.

Paint, Metal Protective.
National Lead Co.
Sherwin-Williams Co.

Paint, Powder.
Aluminum Co. of America.

Paints.
Lehon Co., The.
National Lead Co.
Sherwin-Williams Co.

Paper, Carbon.
Remington-Rand Business Service

Paper, Sheathing.
Carey & Co., Philip, The.
Lehon Co., The.

Pavement Breakers.
Ingersoll-Rand Co.

Pickling Equipment, Monel Metal.
International Nickel Co., The.

Pile Drivers.
American Hoist & Derrick Co.
Industrial Brownhoist Co.

Piling, Creosoted.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Piling, Sheet Steel.
American Bridge Co.
Carnegie Steel Co.

Pilot Beams, Cast Steel.
General Steel Castings Corp.
Gould Coupler Co., The

Pilots, Cast Steel.
General Steel Castings Corp.
Locomotive Finished Material Co.

Pins, Airbrake.
Steel Car Forge Company.

Pins, Center.
Miner, W. H.

Pins, Coupler Knuckle.
McConway & Torley Co.
National Malleable & Steel Castings Co.

Pins, Crank.
American Locomotive Co.
Baldwin Locomotive Works
Miner, Inc., W. H.
Standard Steel Works Co.
Union Asbestos & Rubber Corp.

Pipe Coverings.
Carey & Co., Philip, The.
Johns-Manville Corp.

Pipe Fittings—(See Fittings, Pipe).

Pipe, Metal Culvert.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Republic Steel Corp.

Pipe, Steel Signal.
National Tube Co.

Pipe, Wrought Iron.
Byers Co., A. M.
Reading Iron Co.

Pits, Drop Pit Tables.
Whiting Corporation.

Planers, Plate.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Plates.
Steel Car Forge Co.

Plates, Follower.
Steel Car Forge Co.

Plates, Boiler, Firebox—(See Steel Firebox).

Plates, Center—(See Bearings, Center).

Plates, Iron & Steel.
Armco Railroad Sales Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Interstate Iron & Steel Co.
Ryerson & Son, Joseph T.

Plates, Tie.
Illinois Steel Co.
Inland Steel Company.
Interstate Iron & Steel Co.
Railroad Supply Co.
Tennessee Coal, Iron & Railroad Co.

Plates, Tin and Terne.
American Sheet & Tin Plate Co.

Platforms, Car.
Gould Coupler Co., The.
Standard Coupler Co.

Platforms, Cast Steel, Passenger Car
General Steel Castings Corp.

Plows, Railroad and Grading.
Western Wheeled Scraper Co.

Plows, Snow.
American Locomotive Co.
Brill Co., The J. G.
Clark Tructractor Co.
Jordan Co., O. F.
Q & C Co., The.

Plugs, Arch Tube.
Prime Mfg. Co., The.

Plugs, Oil & Grease Cup.
Prime Mfg. Co., The.

Plugs, Washout.
Prime Mfg. Co., The.

Plush, Mohair.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles.
Central Coal & Coke Co.
General Electric Supply Corp.
Graybar Electric Co.

Poles, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Poles, Signal.
General Railway Signal Co.
International Creosoting & Construction Co.
Union Switch & Signal Co.
Whiting Corporation.

Poles, Steel Tubular.
Graybar Electric Co.
National Tube Co.

Poles, Zinc Metal Arsenite Treatment.
Curtin-Howe Corp.

Posts, Fence.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Posts, Fence, Creosoted.
Inland Steel Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Posts, Steel Fence.
American Steel & Wire Co.
Q & C Co., The.

Powder, Blasting—(See Explosives).

Powdered Coal Equipment.
Muhlfeld, John E.

ower Transmission Supplies.
Sellers & Co., Inc., Wm.

Power Plants.
General Electric Co.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Power Shovels.
American Hoist & Derrick Co.
Northwest Engineering Co.

Power Transmission Supplies.
Sellers & Co., Inc., Wm.
Wrought Iron Co. of America.

Preservatives, Wood.
Century Wood Preserving Co.
Jennison-Wright Co.

Presses, Flanging Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Presses, Hydraulic.
Birdsboro Steel Foundry & Mach Co.

Presses, Wheel.
Birdsboro Steel Foundry & Mach Co.
Sellers & Co., Inc., Wm.

Pulverizers, Coal — (See Crushers, Coal).

Pullers, Car Electric.
Whiting Corporation.

Pullshovels.
American Hoist & Derrick Co.
Whiting Corporation.

Pulverized Coal Burning Systems.
Whiting Corporation.

Pumping Stations.
Fairbanks-Morse & Co.

Pump Liners, Monel Metal.
International Nickel Co., The.

Pump Rods, Monel Metal.
International Nickel Co., The.

Pump Shafts, Monel Metal.
International Nickel Co., The.

Pumps, Hydraulic.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pumps & Pumping Machinery.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Pumps, Vacuum.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Punching and Shearing Machines.
Ryerson & Son, Joseph T.

Pushers, Coal.
Standard Stoker Co.

Pyrometers, Superheated Steam.
Superheater Co., The.

Rail Anchors.
Bethlehem Steel Co.
P. & M. Co., The.

Rail-Bonds.
American Steel & Wire Co.
General Cable Corp.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Rail Braces — (See Braces, Rail).

Rail Cranes.
American Hoist & Derrick Co.

Rail Reclamation Equipment.
Ryerson & Son, Joseph T.

Railroad Shops.
United Engineers & Constructors, Inc.

Rail Splice Plates — (See Joints, Rail).

Railroad Structures — (See Engineers and Contractors; also Building).

Rails.
Bethlehem Steel Co.
Carnegie Steel Co.
Hyman-Michaels Co.
Illinois Steel Co.
Inland Steel Co.
Tennessee Coal, Iron & Railroad Co.
Thomson Rail Corp.

Rails, Relaying.
Hyman-Michaels Co.

Railway Signals.
General Electric Supply Corp.

Rattan.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Receivers, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.

Recorders, Speed & Cut-off.
Valve Pilot Co.

Rectifiers for Signal Work.
General Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.

Reducing Valves.
Vapor Car Heating Co., Inc.

Reflectors, Headlight.
Sunbeam Electric Mfg. Co.

Refrigerators.
American Radiator Co.
Wine Railway Appliance Co.

Regulators, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Relays.
General Railway Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Removers, Paint & Varnish.
Oakite Products, Inc.

Repair Parts, Stoker.
Standard Stoker Co.
Q & C Company, The.

Retorts Creosoting.
Graver Tank & Mfg. Corp.

Reverse Gear, Power.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Rivet Cutters.
Ingersoll-Rand Co.
Interstate Iron & Steel Co.

Riveters, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Riveting Machines.
Ingersoll-Rand Co.

Rivets.
Inland Steel Co.
Neely Nut & Bolt Co.
Ryerson & Son, Joseph T.
Pressed Steel Car Co.
Russell, Burdsall & Ward Bolt and Nut Co.

Rods.
Neely Nut & Bolt Co.

Rolled Steel.
Carnegie Steel Co.

Roller Bearings (See Bearings, Roller).

Rolls, Bending & Straightening.
Birdsboro Steel Foundry & Mach. Co.

Roof Decks, Steel.
Mahon Co., R. C.

Roof Slabs, Concrete.
Federal American Cement Tile Co.

Roofing, Asbestos.
Carey & Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.

Roofing, Buildings.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.

Roofing, Car.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey & Co., Philip, The.
Lehon Co., The.
Hutchins Car Rfg. Co.
Johns-Manville Corp.
Tuco Products Corp.
Union Metal Products Co.

Roofing, Corrugated.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Johns-Manville Corp.

Roofing, Tile.
Federal American Cement Tile Co.

Roofing, Tile, Cement.
Federal American Cement Tile Co.

Roofing, Tin.
American Sheet & Tin Plate Co.

Rope, Wire — (See Wire Rope).

Rust Preventatives.
Dearborn Chemical Co.
Oakite Products, Inc.

Safe Ends.
National Tube Co.

Sand Drying Plants.
Roberts & Schaefer Co.

Sand Plants.
Railway Engineering Equipment Co.

Sanitary Products.
West Disinfecting Co.

Sash Balances.
Tuco Products Co.

Saws, Circular Metal.
Ryerson & Son, Joseph T.

Saws, High Speed, Friction.
Ryerson & Son, Joseph T.

Saws, Portable Rail.
Industrial Brownhoist Corp
Q & C Co., The.

Scales.
Fairbanks-Morse & Co.

Scrapers, Wheeled and Drag.
Western Wheeled Scraper Co.

Screens, Passenger Car.
Tuco Products Corp.

Seats, Car.
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Coach.
Brill Co., The J. G.

Shafting.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Standard Steel Works Co.

Shapers.
Ryerson & Son, Joseph T.

Shapes, Pressed Steel.
Pressed Steel Car Co.
Sellers & Co., Inc., Wm.

Shapes, Structural.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheds, Train.
American Bridge Co.
Inland Steel Co.

Sheets, Black and Galvanized.
Allegheny Steel Co.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Blue Annealed.
Allegheny Steel Co.

Sheets, Car & Building.
American Rolling Mill Co.

Sheets, Corrugated.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Carnegie Steel Co.
Johns-Manville Corp.
Ryerson & Son, Joseph T.

Sheets, Corrugated and Plain.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheets, Electrical.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Iron & Steel.
Armco Railroad Sales Co.
Bethlehem Steel Co.

Sheets, Locomotive Jacket.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.

Sheets, Polished or Planished. Iron.
American Rolling Mill Co.
American Sheet & Tin Plate Co.

Sheets, Steel.
American Rolling Mill Co., The.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sherardising Plants.
General Electric Co.

Shop Calling Systems—(See Systems, Communication)

Shops, Railroad—(See Buildings, Iron, Steel and Steel Concrete).

Shovels & Draglines.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Shovels, Gasoline & Electric.
American Hoist & Derrick Co.

Shovels, Steam, Gasoline & Electric.
American Hoist & Derrick Co.
Clark Tructractor Co.
Orton Crane & Shovel Co.

Siding, Bldg., Car, Corrugated & Plain.
Kinnear Mfg. Co.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Inland Steel Co.

Siding, Corrugated & Plain.
Carey & Co., Philip, The.
Johns-Manville Corp.

Siding, Iron & Steel.
American Rolling Mill Co.

Signal Accessories.
Electric Storage Battery Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Signals, Automatic Cab.
General Railway Signal Co.
Union Switch & Signal Co.

Signal Blades.
General Railway Signal Co.
Union Switch & Signal Co.

Signals, Crossing.
Union Switch & Signal Co.

Signals, Crossing Protection.
General Railway Signal Co.
Railroad Supply Co.

Signals, Railway.
General Electric Co.
Union Switch & Signal Co.

Signs, Highway Crossing.
Railroad Supply Co.

Silico Manganese.
Vanadium Corp. of America

Silicon.
Electro Metallurgical Sales Corp.

Slabs, Concrete Floor.
American Cement Tile Mfg. Co.
Federal Cement Tile Co.

Slag, Blast Furnace.
Carnegie Steel Co.

Slotting Machines.
Sellers & Co., Inc., Wm

Slotting Machines, Locomotive Cylinder.
American Steel & Wire Co.

Sludge Removers.
Bird-Archer Co., The.

Soap, Liquid.
West Disinfecting Co.

Snow Plows.
Jordan Co., O. F.

Solder.
National Bearing Metals Corp.
Westinghouse Elec. & Mfg. Co.

Special Machinery.
Whiting Corporation.

Speed Indicators & Recorders.
Valve Pilot Corp.

Spelter—(See Zinc).

Spikes.
American Steel & Wire Co.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Splice Bars, Angle.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.

Spreaders, Ballast.
Jordan Co., O. F.

Spring, Plates or Seats.
Allegheny Steel Co.
National Malleable & Steel Castings Co.
Union Spring & Mfg. Co.

Springs.
American Steel Foundries Co.
American Steel & Wire Co.
Pittsburgh Spring & Steel Co.
Railway Steel Spring Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Switch & Signal Co.

Springs, Shop Equipment.
Ryerson & Son, Joseph T.

Springs, Vanadium Steel.
Pittsburgh Spring & Steel Co.
Union Spring & Mfg. Co.

Stacks, Steel.
American Bridge Co.
Graver Tank & Mfg. Corp.

Stands, Switch & Target.
Q & C Co., The.

Staybolts.
American Locomotive Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Flannery Bolt Co.
Ryerson & Son, Joseph T.

Staybolts, Hollow.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Steam Chests.
Franklin Railway Supply Co., Inc.

Steam Enclosures, Corrugated Iron.
Republic Steel Corp.

Steam Shovels.
American Hoist & Derrick Co.
Orton Crane & Shovel Co.

Steel Alloy.
Illinois Steel Co.
Ryerson & Son, Joseph T.
Republic Steel Corp.
Standard Steel Works Co.

Steel, Firebox.
Carnegie Steel Co.
Illinois Steel Co.

Steel, Heat Treated.
Interstate Iron & Steel Co.

Steel & Iron, Stainless.
Allegheny Steel Co.

Steel, Open Hearth.
Carnegie Steel Co.
Illinois Steel Co.

Steel Plate Construction.
Graver Tank & Mfg. Corp.

Steel, Pressed Specialties.
Hale-Kilburn Co.

Steel, Structural.
American Bridge Co.
Carnegie Steel Co.
Graver Tank & Mfg. Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Steel, Tool.
Illinois Steel Co.
Midvale Co., The.
Q & C Co., The.
Ryerson & Son, Joseph T.

Step Joints.
Q & C Co., The
Rail Joint Co.

Steps, Car—(See Car Steps, Safety).

Stokers, Industrial.
Whiting Corporation.

Stokers, Locomotive.
Standard Stoker Co.

Stokers, Mechanical.
Westinghouse Elec. & Mfg. Co.

Stoker Repair Parts.
Standard Stoker Co.

Storm Sewers, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Strainer, Air.
Westinghouse Air Brake Co.

Strainers, Tank Hose.
Prime Mfg. Co., The.

Stream Enclosures, Corrugated Iron.
Armco Culvert Mfrs. Assoc.

Stringers, Bridge.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.

Stringers, Bridge, Creosoted.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Structural Shapes, Rolled Shapes.
Carnegie Steel Co.

Superheaters.
Superheater Co., The.

Supports, Bottom Rod Safety.
Chicago Railway Equipment Co.

Switch Boards.
Graybar Electric Co.
Johns-Manville Corp.
Westinghouse Elec. & Mfg. Co.

Switch Machines.
General Railway Signal Co.

Switch Movements.
Union Switch & Signal Co.

Switch Ties.
International Creosoting & Construction Co.

Switch Ties, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Switches, Electric.
Electric Service Supplies Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Switches & Switch Stands.
Ramapo Ajax Corp.

Syphons, Corrugated Iron.
Armco Culvert Mfrs. Association.
Republic Steel Corp.

Syphons, Locomotive.
Locomotive Firebox Co.

Syphons, Locomotive, Boilers
Locomotive Firebox Co.

Tables, Drop Pit Electric.
Whiting Corporation.

Tables, Transfer.
Whiting Corporation.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tamping Machines, Tie.
Ingersoll-Rand Co.

Tamping Outfits, Tie.
Ingersoll-Rand Co.

Tanks, Acetylene, Gas.
Oxweld Railroad Service Co., The.

Tanks, Air, Gas, Oil and Water.
Graver Tank & Mfg. Corp.

Tanks, Water.
American Bridge Co.
American Locomotive Co.
National Tube Co.
Pressed Steel Car Co.
Westinghouse Air Brake Co

Tape, Insulation.
Johns-Manville Corp.
Okonite Co., The.
Westinghouse Elec. & Mfg. Co.

Taps, Staybolt.
Ryerson & Son, Joseph T.

Tele. & Tele. Wire.
General Cable Corp.
General Electric Supply Corp.

Terminals, Railroad.
United Engineers & Constructors, Inc.

Testers, Boiler.
Sellers & Co., Inc., Wm.

Testers, Gage.
Ashton Valve Co.

Testers, Rail.
Sperry Products, Inc.

Testers, Staybolt.
Flannery Bolt Co.

Testing Machines, Drop.
Whiting Corporation.

Thermostats.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.

Throttles.
American Throttle Co.

Tie Plates.
Bethlehem Steel Co.
Illinois Steel Co.
Railroad Supply Co.

Ties, Creosoted.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Ties, Steel.
American Bridge Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Ties, Wood.
Curtin-Howe Corp.
International Creosoting & Construction Co.

Tile, Cement, Concrete.
Federal American Cement Tile Co.

Timber.
Central Coal & Coke Co.
Curtin-Howe Corp.

Tires.
Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.
Goodrich Rubber Co., B. F.

Timber, Creosoted.
Century Wood Preserving Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Tires, Steel.
Edgewater Steel Co.
Midvale Co., The
Railway Steel Spring Co.
Standard Steel Works Co.

Toilet Papers.
U. S. Envelope Co.

Tools, High Speed Steel.
Bethlehem Steel Co.
Bird-Archer Co., The.

Towers, Floodlight.
Pyle-National Co.

Track, Overhead.
Whiting Corporation.

Track Skates.
Q & C Co., The.

Tractors.
Caterpillar Tractor Co.
Elwell-Parker Electric Co.
Industrial Lumber Co.
International Creosoting & Construction Co.
West Coast Lumber Trade Extension Bureau.

Tractors, Industrial.
Clark Tructractor Co.
Elwell-Parker Electric Co.
International Harvester Co.

Tractors, Turntable.
Nichols & Bros., Geo. P. Whiting Corporation.

Trailers.
Clark Tructractor Co.

Train Control Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Tramrail System, Overhead.
Whiting Corporation.

Tramways, Wire Rope.
American Steel & Wire Co.

Transfer Tables.
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bros., Geo. P. Whiting Corporation.

Transformers.
General Electric Supply Corp.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Trap Doors.
Edwards Co., O. M.

Trap Doors & Fixtures.
Tuco Products Corp.

Traps, Steam.
Johns-Manville Corp.

Treads, Bridge Floor.
Carnegie Steel Co.

Treads, Safety.
Ryerson & Son, Joseph T.

Treatment, Water—(See Water Softening and Purifying).

Trolleys, Monorail.
Whiting Corporation.

Truck Frames—(See Frames, Truck).

Trucks, Oxy-Acetylene Supply.
Oxweld Railroad Service Co., The.

Trucks, Car.
St. Louis Car Co.

Trucks, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bettendorf Company, The.
Birdsboro Steel Foundry & Mach. Co.
Brill Co., The J. G.
Flexible Truck Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co.
Mt. Vernon Car Mfg. Co
Pressed Steel Car Co.
St. Louis Car Co.
Standard Car Truck Co.
Symington Co., The.

Trucks, Cast Steel Tender
General Steel Castings Corp.

Trucks, Cast Steel, Electric Car
General Steel Castings Corp.

Trucks, Cast Steel, Car & Locomotive
General Steel Castings Corp.

Trucks, Dump.
Clark Tructractor Co.

Trucks, Electric Storage Battery.
Elwell-Parker Electric Co.
Whiting Corporation.

Trucks, Industrial.
Elwell-Parker Electric Co.

Trucks, Motor.
Dodge Motor Truck Corp.
General Motors Truck Co.
International Harvester Co.
White Co., The.

Trucks, Shop.
Clark Tructractor Co.
Whiting Corporation.

Trucks, Tender.
Flexible Truck Co.

Trucks, Trailer.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.

Tubes, Arch.
National Tube Co.

Tubes, Boiler.
Allegheny Steel Co.
Bethlehem Steel Co.
National Tube Co.
Ryerson & Son, Joseph T.

Tubes, Boiler, Charcoal Iron.
Bethlehem Steel Co.
Reading Iron Co.

Tubes, Staybolt.
Falls Hollow Staybolt Co.

Tubes, Tire.
Firestone Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tubing.
Aluminum Co. of America.

Tubing, Seamless Steel.
National Tube Co.

Tungsten Metal.
Vanadium Corp. of America.

Turbo Generators.
Electric Service Supplies Co.
General Electric Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Turnbuckles.
American Bridge Co.
American Steel & Wire Co.
Ryerson & Son, Joseph T.

Turntable Tractors.
Nichols & Bros., Geo. P. Whiting Corporation.

Turntables.
American Bridge Co.
Industrial Brownhoist Corp.

Turntables, Overhead Track.
Whiting Corporation.

Turntables, Industrial.
Whiting Corporation.

Turntables, Motor Bus.
Whiting Corporation.

Typewriter Ribbons.
Remington-Rand Business Service.

Typewriters.
Remington-Rand Business Service.

Uncoupling Device.
Hutchins Car Rfg. Co.

Undercrossings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Underfloor Duct.
General Electric Supply Corp.

Underfloor Duct, Fibre and Metal.
Johns-Manville Corp.

Underframes, Cast Steel. Tender
General Steel Castings Corp.

Underframes, Cast Steel, Freight Car.
General Steel Castings Corp.

Underframes, Steel.
Bettendorf Co., The.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Underground Conduit.
General Electric Supply Corp.

Upholstery, Car.
Brill Co., The J. G.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Valve Caps.
Schrader's Son, Inc., A.

Valve Gears, Locomotive.
Pyle-National Co.

Valves, Air Brake.
Westinghouse Air Brake Co.

Valves, Back Pressure Acetylene.
Oxweld Railroad Service Co., The.

Valves, Blow-Off.
Bird-Archer Co., The.

Valves, Check & Angle Steam
Sellers & Co., Inc., Wm.

Valves, Drifting.
Ardco Mfg. Co.
Sellers & Co., Inc., Wm.

Valves, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Valves, Piston.
Franklin Railway Supply Co., Inc.

Valves, Pop, Safety & Relief.
Ashton Valve Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Valves, Pressure Regulating.
Gold Car Heating & Lighting Co.

Valves, Tire.
Schrader's Son, Inc., A.

Valves, Throttle.
Bradford Corporation.

Vanadium.
Electro Metallurgical Sales Corp.

Varnish Powder.
Aluminum Co. of America.

Varnishes.
General Electric Supply Corp.
Sherwin-Williams Co.

Ventilators, Car.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Ventilators, Shop & Roundhouse.
Carey Co., Philip, The.
Johns-Manville Corp.

Wardrobes, Rolling and Disappearing Front — (See Lockers).

Washers.
National Malleable & Steel Castings Co.
Reliance Mfg. Co.
Ryerson & Son, Joseph T.
Wine Railway Appliance Co.

Washers, Boiler.
Sellers & Co., Inc., Wm.

Washers, Lock.
Reliance Manufacturing Co., The.

Washers, Railway Car.
Whiting Corporation.

Water Alarms — (See Low Water Alarms).

Waterproofing Materials and Compounds.
Carey Co., Phillip, The.
Lehon Co., The.
Johns-Manville Corp.

Water Purifying Materials & Compounds.
Bird-Archer Co., The.
Dearborn Chemical Co.

Water Softening & Purifying.
Bird-Archer Co., The.
Dearborn Chemical Co.
Graver Tank & Mfg. Corp.

Weather Stripping.
Tuco Products Corp.

Wedges, Automatic.
Franklin Railway Supply Co., Inc.

Wedges, Journal Box.
American Steel Foundries.
Gould Coupler Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Company.
Symington Co., The.

Weed Killer.
Q & C Co., The.

Welding Equipment.
Clark Tructractor Co.

Welding Machines, Acetylene.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Welding Machines, Electric.
General Electric Co.
Ryerson & Son, Joseph T.

Welding Machines, Flue.
Ryerson & Son, Joseph T.

Welding Materials.
Oxweld Railroad Service Co.
Franklin Railway Supply Co., Inc.

Welding Process.
Oxweld Railroad Service Co.

Welding Rods.
American Steel & Wire Co.
General Electric Supply Corp.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.

Welding Supplies.
General Electric Co.
Oxweld Railroad Service Co., The.

Welding and Cutting Apparatus—(See Cutting and Welding Apparatus).

Well Casings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Wheel Centers, Driving.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Mach. Co.
Edgewater Steel Co.
Hunt-Spiller Mfg. Corp.
Standard Steel Works Co.
Union Steel Casting Co.

Wheels, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Cast Iron, Chilled Tread.
Assn. of Mfrs. of Chilled Car Wheels.
Graybar Electric Co.
Griffin Wheel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Wheels, Mine Car.
Carnegie Steel Co.
Edgewater Steel Co.
Mt. Vernon Car Mfg. Co.
Standard Steel Works Co.

Wheels, Passenger Car.
Carnegie Steel Co.
Illinois Steel Co.
Edgewater Steel Co.
Pullman Car & Mfg. Corp.
Standard Steel Works Co.

Wheels, Steel and Steel Tired
American Locomotive Co.
American Steel Foundries.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Wrought Steel.
American Rolling Mill Co.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Standard Steel Works Co.

Whistles.
Ashton Valve Co.

Whistles, Locomotive.
General Electric Co.
Westinghouse Air Brake Co.

Window Fixtures.
Edwards Co., O. M.
Tuco Products Corp.

Windows, Locomotive Cab, Clear Vision.
Prime Manufacturing Co.

Windshield Wings, Loco.
Prime Mfg. Co., The.

Wire.
American Steel & Wire Co.
General Cable Corp.
Kerite Insulated Wire & Cable Co.
Okonite Co., The

Wire, Fence.
American Steel & Wire Co.

Wire, Insulated.
American Steel & Wire Co.
General Cable Corp.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

Wire, Rail Bond.
American Steel & Wire Co.
General Cable Corp.
Graybar Electric Co.

Wire Rope Clips.
American Hoist & Derrick Co.

Wire Rope.
American Steel & Wire Co.

Wire, Telephone & Telegraph.
American Steel & Wire Co.
General Cable Corp.
Graybar Electric Co.

Wire, Welding.
Oxweld Railroad Service Co., The.

Wiring Appliances.
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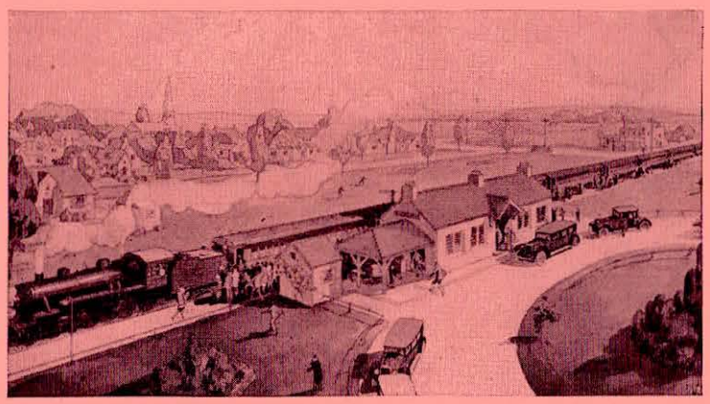

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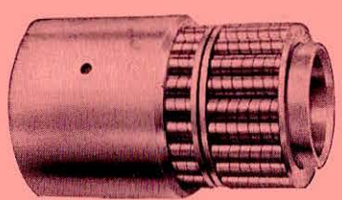

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"The volume of signaling installations completed during 1930 was about nine per cent in excess of the previous year and considerably above that for 1927, the previous peak year in terms of miles of road equipped with automatic block.

"As a matter of fact, the miles of road signaled in 1930 was 20 per cent less than in 1929 and 28 per cent less than in 1927. However, the increased popularity of remote power-operated switches with centralized control for directing train movements has been an important factor in maintaining the total volume of expenditures in the signal field. Likewise, interlocking programs exceeded those of the previous year, as did also the installation of automatic highway crossing signals.

"Because of changed conditions, the mileage of line equipped with new signaling can no longer be used as the most important gage of activity in the signaling field. Although there are thousands of miles of important lines yet to be signaled, nevertheless a greater volume of apparatus is being installed on lines which have been signaled for years. These improvements include not only the replacement of old automatic signals, but also cab signaling, train control, new interlockings, remote and centralized control systems and car retarders."

*Excerpt from **Railway Age**, Annual Statistical Number, page 4.

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